PROGRESSIVE ARCHITECTURE *September 1961*

unique floor beauty that won't "walk off"...

Vina-Lux® 800 Series

Now, a vinyl asbestos floor tile with distinctive color chip styling that won't wear away under heavy, concentrated traffic. The chip pattern is distributed at every level through the full thickness of the tile. Vina-Lux 800 Series costs no more than ordinary vinyl asbestos tile... yet delivers so much more value.

The Vina-Lux 800 Series can be specified for installation over concrete – even below grade, or over wood subfloors. In 12 fashion-coordinated colors; 9"x 9" size; $\frac{1}{8}$", $\frac{3}{32}$" and $\frac{1}{16}$" gauges. See Sweet's Catalog or write for samples, color charts and complete architectural specifications – no obligation, of course.

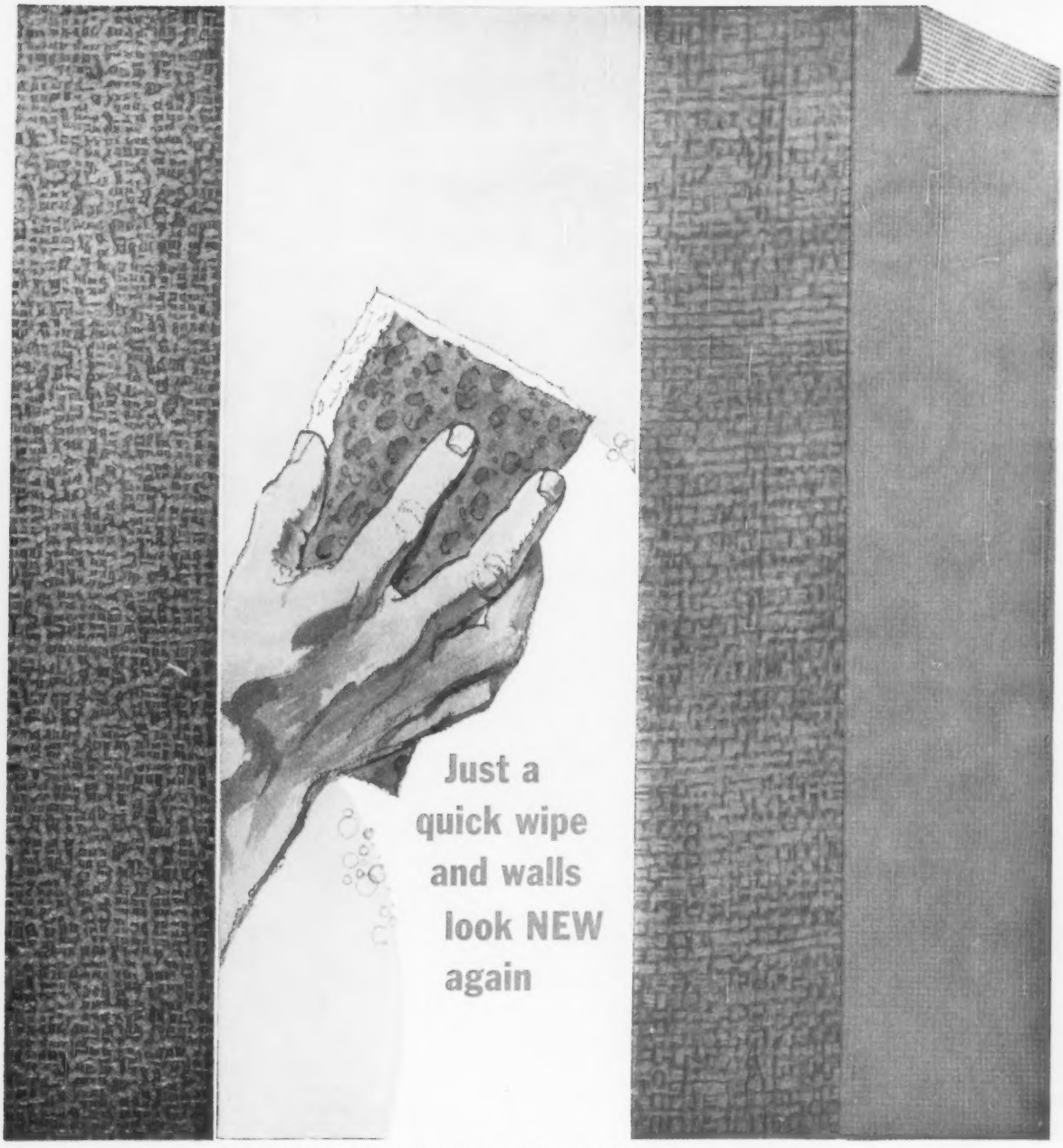
For more information, turn to Reader Service card, circle No. 325

AZROCK FLOOR PRODUCTS DIVISION

Specialists in the manufacture of vinyl asbestos tile and asphalt tile flooring

UVALDE ROCK ASPHALT COMPANY • 525A FROST BANK BUILDING • SAN ANTONIO, TEXAS

AZROCK FLOORING PRODUCTS



Koroseal patterns shown actual size (left to right) are: Nassau, Straw Weave, and Linen Weave.

Bright, cheerful Koroseal wall coverings slash building maintenance costs

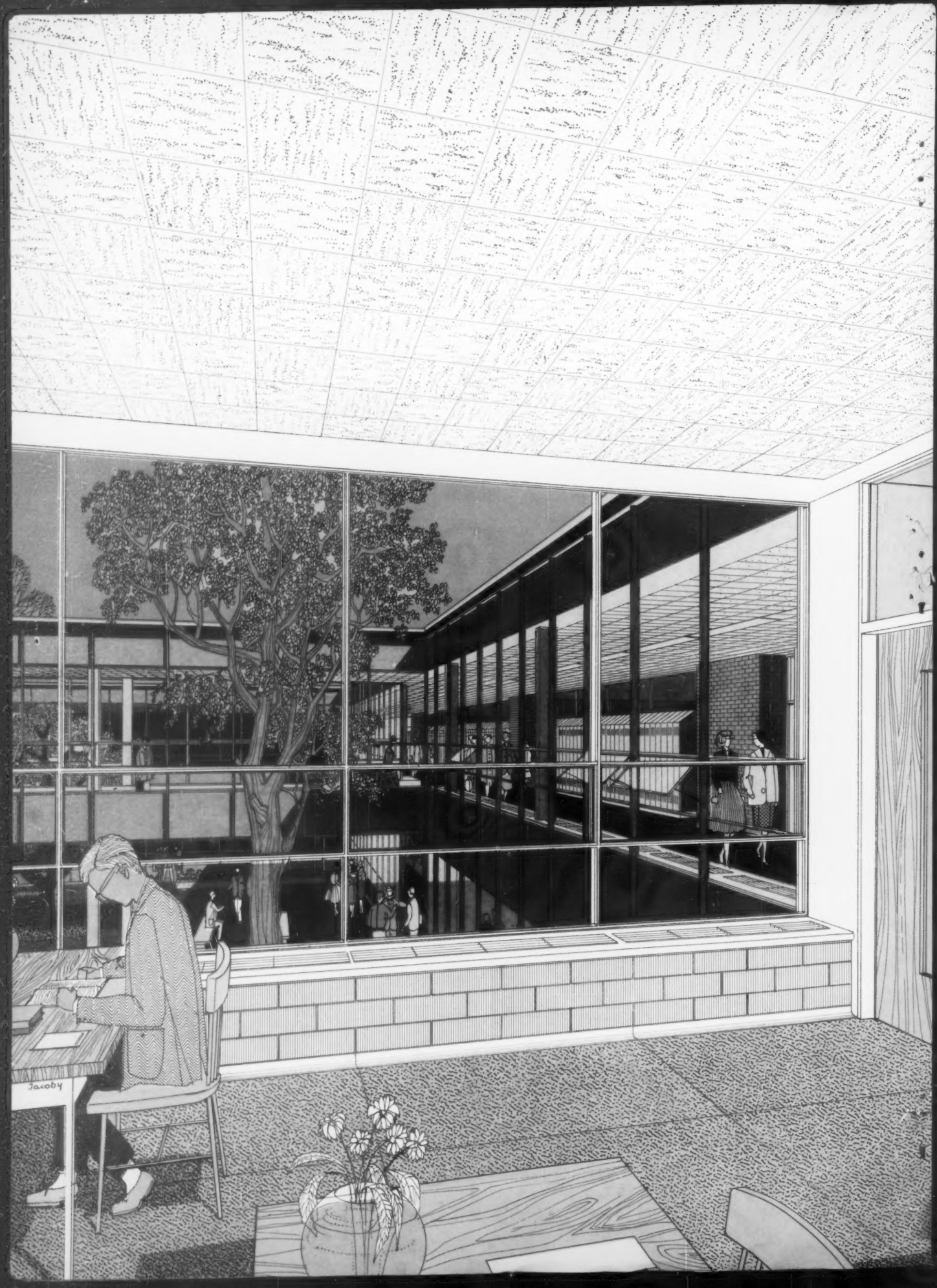
Koroseal vinyl wall coverings by B.F.Goodrich add beauty in any building with their rich colors and subtle textures. And their durability and easy upkeep help reduce wall maintenance costs for years to come.

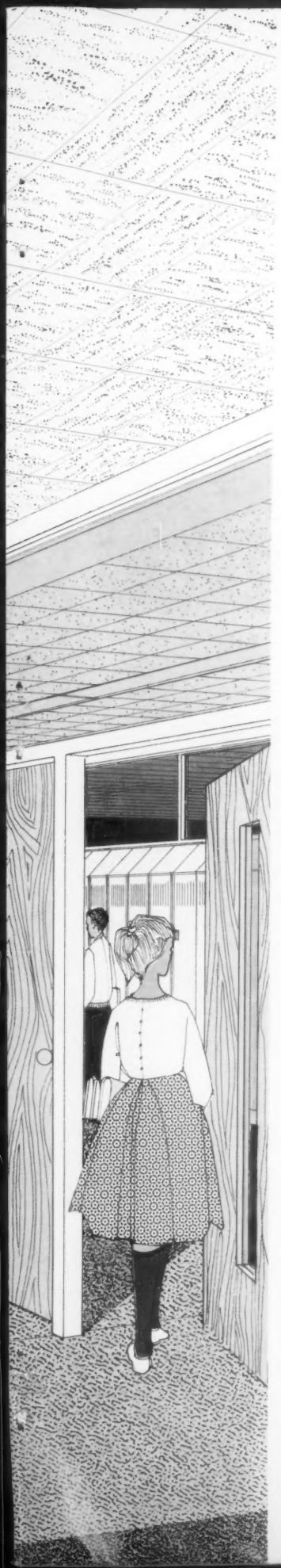
Fabric-backed, flame-proofed Koroseal wall coverings resist scuffs, scratches and stains. They keep their fresh, clean appearance for years with infrequent soap and water wipe-downs. The profit-cutting expense of periodic repaintings, often with complete shut-down of income-producing space, is drastically reduced. For information, write Dept. PA-9, *B.F.Goodrich Industrial Products Company, Marietta, Ohio.*

B.F.Goodrich

Koroseal®

VINYL WALL COVERING


Jacoby



How Armstrong Acoustical Fire Guard cut ceiling costs on this Ohio school by 53¢ a square foot. Saved: $56,069

ON THE LEFT you see a Helmut Jacoby rendering of the new Valley Forge High School, Parma Heights, Ohio. To meet the specifications of Architects Fulton, Dela Motte, Larson, Nassau & Associates, of Cleveland, ceilings in the school had to perform two major functions —provide acoustical treatment and meet a two-hour fire code requirement.

Specifications called for Armstrong Acoustical Fire Guard or an alternative of acoustical tile cemented to plaster. The firm which was awarded the contract submitted a bid showing that Acoustical Fire Guard would cost $56,069 *less* than the alternate. This represented a saving of 53¢ per square foot since 105,000 square feet of Acoustical Fire Guard ceilings were specified.

Widest Range of Time-Design Ratings

Acoustical Fire Guard, available in both 12 x 12 inch tile and 24 x 48 inch lay-in units, offers you more than significant savings like this. To date, eleven different floor and ceiling assemblies incorporating Acoustical Fire Guard ceilings have been tested at Underwriters' Laboratories, Inc. Ratings of from one to four hours are available within these eleven assemblies. Therefore, Fire Guard offers you the widest available range of UL time-design ratings for fire-retardant acoustical tile and lay-in ceiling systems.

Accepted by Code Authorities

The variety of floor-and-ceiling assemblies, incorporating Acoustical Fire Guard ceilings, will suit most forms of construction. This gives you more flexibility in the selection of UL rated fire-retardant acoustical ceilings. Since Acoustical Fire Guard has been meeting rigid fire code requirements across the nation for more than two years, it is widely recognized by local fire code authorities.

Also, Acoustical Fire Guard tile and lay-in units can be combined effectively in different areas of the same project. This is because both offer the popular Fissured and Classic surface patterns. And the factory-finished surface requires no painting and a minimum of maintenance.

Phone Your Armstrong Acoustical Contractor

From one construction project after another comes proof that Armstrong Acoustical Fire Guard can sharply reduce your ceiling construction costs. To learn more about how Acoustical Fire Guard will meet your design requirements, and at the same time save money, call your Armstrong Acoustical Contractor (he's in the Yellow Pages under "Acoustical Ceilings"), your nearest Armstrong District Office, or write to Armstrong Cork Company, 4209 Watson St., Lancaster, Pa.

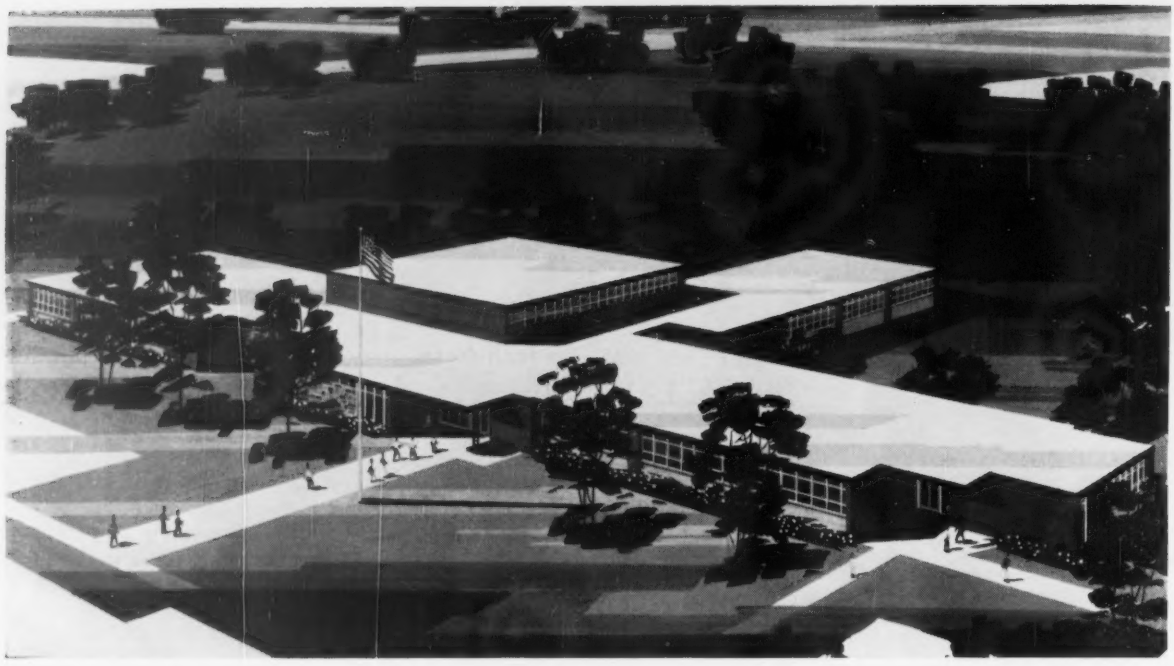
Here are 9 Acoustical Fire Guard UL ratings most frequently used to meet fire code requirements

FIRE GUARD LAY-IN		FIRE GUARD TILE	
Floor & Ceiling Design	Rating	Floor & Ceiling Design	Rating
#30	2-hr. (Beam—3-hr.)	#31	4-hr.
		#21	4-hr.
#13	2-hr. (Beam—3-hr.)	#8	2-hr.
		#7	1½-hr.
#21	2-hr.	#9	1-hr.
#8	1½-hr.		

Armstrong ACOUSTICAL CEILINGS

First in fire-retardant acoustical ceilings

Superintendent of Schools for Parma: Mr. Paul W. Briggs
Architect: Fulton, Dela Motte, Larson, Nassau & Associates, Cleveland
General Contractor: H. J. Forepaugh and Son, Bedford, Ohio
Acoustical Contractor: The Gellin Company, Cleveland



38,500 Square Feet...18 Classrooms Plus...

Complete Heating and Ventilating Comfort Everywhere
Lower Construction Costs, Lower Operating Costs
NORMAN SCHOOLROOM SYSTEMS

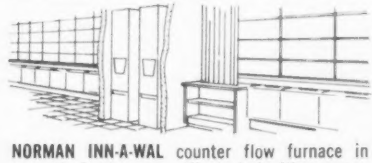
Here's another illustration of the way Norman gas-fired individual classroom packages permit construction economies and assure low cost operation. This new Boulder Hill Elementary School has 18 classrooms plus multi-purpose room, stage and music room, kitchen, administrative rooms and other areas.

By specifying Norman Schoolroom Heating and Ventilating Systems for classrooms, it was not necessary to add boiler rooms, pipe tunnels, connecting ducts or a chimney.

A Norman System in each room or area automatically blends fresh outdoor air with recirculated room air . . . automatically compensates for occupancy, solar heat gain and other variables . . . and automatically recirculates room air only during unoccupied periods. Air conditioning may be included or added later.

For facts and figures, write for comprehensive manuals on Norman Horizontal and Inn-A-Wal models.

NORMAN ENCLOSED HVS compact horizontal unit illustrated with Util-i-Duct bookshelf sections



NORMAN INN-A-WAL counter flow furnace in separate heater room, illustrated with economical Wall-i-Duct sections

Boulder Hill Elementary School, Oswego, Ill. **Superintendent of Schools:** T. Loyd Traughber **Architects and Engineers:** Kruegel, Healy & Moore, Joliet, Ill. **Heating & Ventilating:** Feltes Heating & Air Conditioning, Aurora, Ill.

Norman® PRODUCTS CO. 1154 Chesapeake Ave., Columbus 12, Ohio

For more information, turn to Reader Service card, circle No. 386

THIS MONTH IN P/A

The World's Largest Architectural Circulation

63 NEWS REPORT *(For Full Contents, See Page 63)*
Madison Square Garden to replace Pennsylvania Station . . . Bush-Brown reports on Joint Conference on Urban Planning . . . Winning design for Trinity College Library, Dublin . . . Mastic Tile Competition results announced . . . Three projects follow new New York zoning laws . . . Reder's visionary architecture at the Whitney . . . PERSONALITIES: Hurst, Nakashima . . . Architects react to Pennsylvania Station demolition . . . WASHINGTON/FINANCIAL NEWS . . . Sternberg reports on UIA Congress . . . PRODUCTS: Steel Technology . . . MANUFACTURERS' DATA.

152 EDITORIAL FEATURES *(For Full Contents, See Page 151)*
Recent advances in design and technical refinements have revealed new potentials for steel as a tectonic material. This is the theme of this special technical issue of P/A, which includes articles that discuss: the properties of the newest steels; the impact of industrialization on building technology; the increased interest in tubular construction, documented by discussion of three remarkable new structures; new applications of stainless steel; a run-down on steel furniture, with specifications data; and the application of the suspension principle to buildings made possible by the refinement of high-strength steels.

216 SPECIFICATIONS CLINIC: Format for Specifications Sections
By Harold J. Rosen

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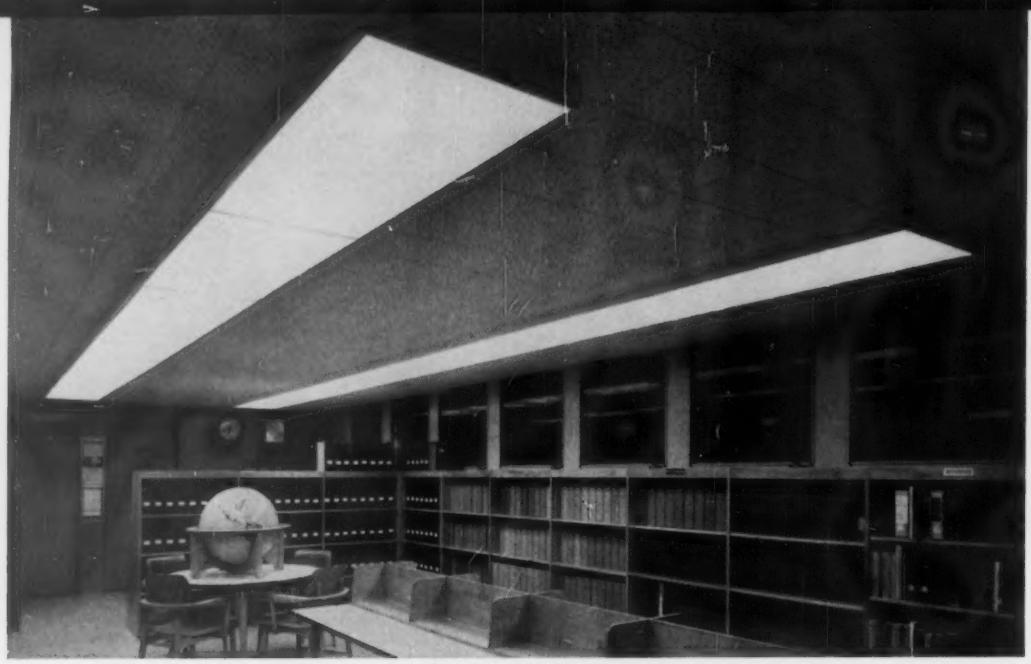
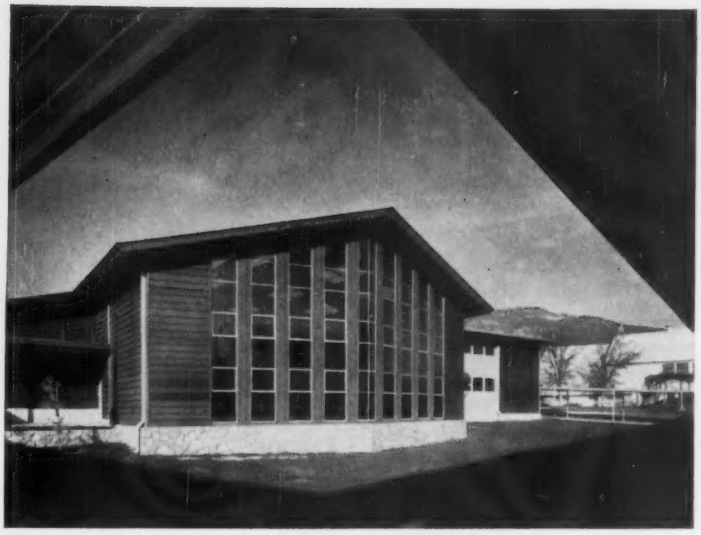


In modern schools such as this, where fixtures are selected for esthetic as well as functional reasons, Day-Brite lighting is the logical choice for creating a pleasant, efficient environment for learning.

The ceiling of the library's main reading room slopes from a height of 22 feet at the center down to 14 feet at the walls. DAYLUME® surface mounted elements maintain 85 to 90 footcandles at reading level.



Sierra Union High School, Auberry, California
Architect: *Alastair Simpson*
Consulting Electrical Engineer: *Edward Lowe*

How Day-Brite helps light the way to learning

The designers of this modern high school wanted the library to be the most attractive building on the campus . . . to encourage students to *use* it.

Good lighting, of course, was a *must*. High, sloping ceilings might have presented a problem . . . especially since suspended fixtures would have marred the clean, uncluttered architectural effect. And structural limitations eliminated any possibility of using recessed equipment.

The solution: shallow DAYLUMES® by Day-Brite because they provide . . .

Recessed appearance with surface mounting flexibility;

High-level, uniform over-all illumination;

And "Decidedly Better" Day-Brite dependability and ease of maintenance.

Got a school lighting problem?

Talk to the people with the most experience in solving them. Call your Day-Brite representative. *Day-Brite Lighting, Inc., St. Louis 15, Mo., and Santa Clara, Calif. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ont.*

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NATION'S LARGEST MANUFACTURER OF
COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT
For more information, turn to Reader Service card, No. 338

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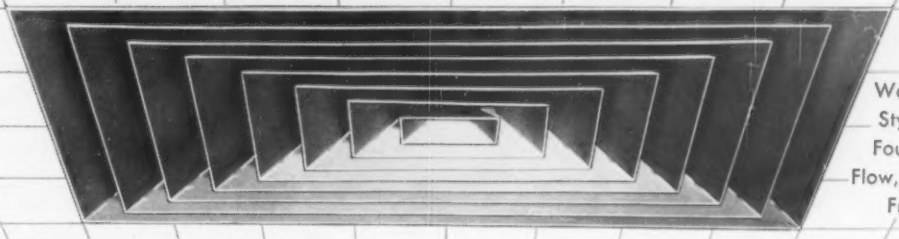
NOW! by Waterloo-Anemostat

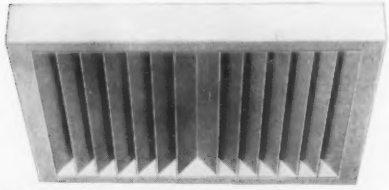
THE FIRST ALL EXTRUDED ALUMINUM TYPE D DIRECTIONAL DIFFUSER



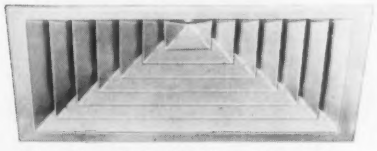
Waterloo Style DE Four Way Flow, Snap-in Frame

SQUARE and RECTANGULAR DESIGNS

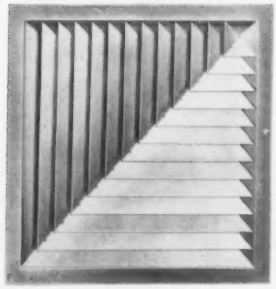
Waterloo Style DM One Way Flow Bevelled Frame



Waterloo Style DD Two Way Opposite Flow Drop Collar Frame



Waterloo Style DF Three Way Flow Flange Frame



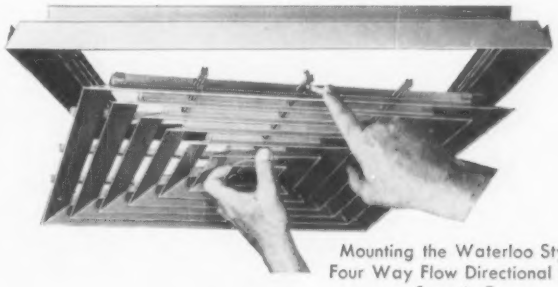
Waterloo Style DL Two Way Corner Flow Lay-on Frame

★ **EASIEST TO INSTALL**

★ **ONE-THIRD THE USUAL WEIGHT**
because of aluminum construction

★ **LONG-LASTING**
All extruded aluminum

★ **5 FRAME STYLES • 14 CORE PATTERNS**
All cores removable and interchangeable



Mounting the Waterloo Style DE Four Way Flow Directional Diffuser Snap-in Frame

DESIGNED BY WATERLOO
...pioneer in development of air diffusion equipment in EXTRUDED ALUMINUM

PERFORMANCE PROVED BY ANEMOSTAT
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WATERLOO REGISTER COMPANY, INC.

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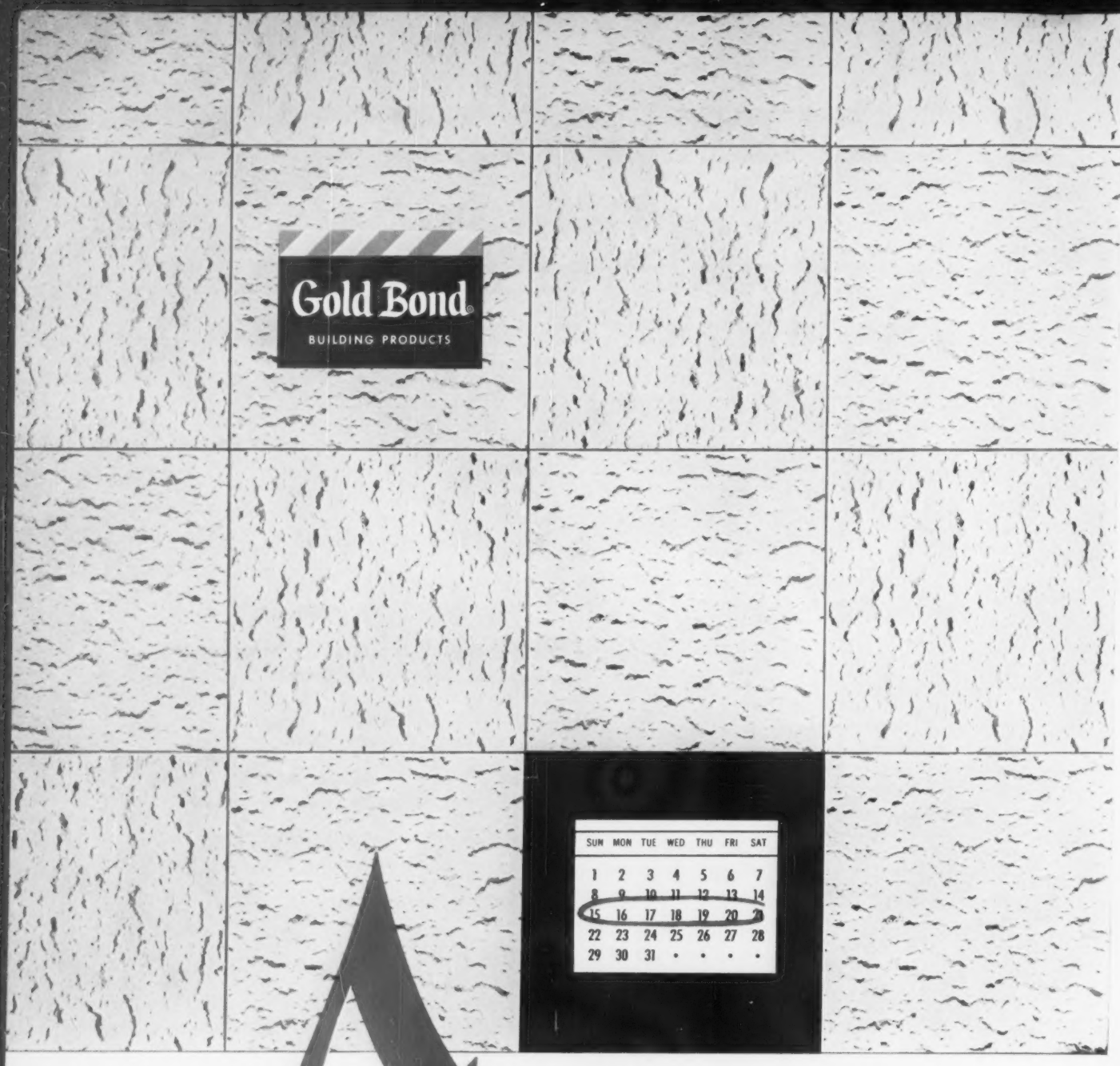
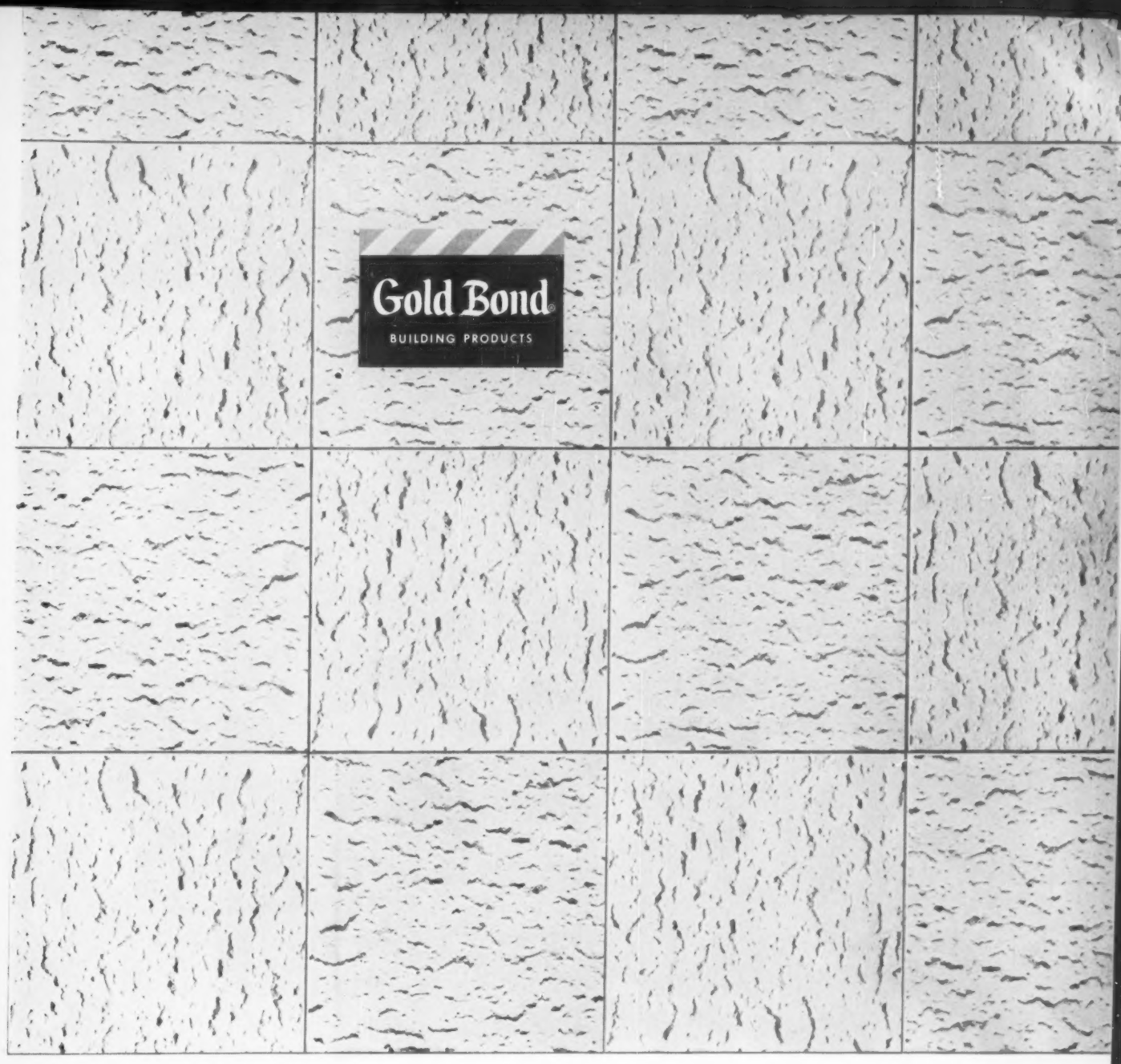


Two-Hour Fire-Rated

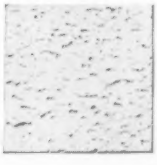
NEW FIRE-SHIELD® ACOUSTIROC

Saves a week or more in building time



TEXTURED

NEEDLE POINT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Fire-Shield Acoustiroc's mineral-wool fibers are *felted* for extra strength and stability. The long fibers are *interlocked*. Acoustiroc has 500% greater resistance to sag, 100% better dimensional stability, and 50% more strength than non-felted mineral wool. As a result, this 12″ x 12″ tile can be safely installed before plaster and terrazzo work are dry, to save seven days, or more, in building time.

U/L-listed Fire-Shield Acoustiroc also has high sound ratings, good attenuation and workability. Three beautiful patterns. Edge detail is beveled, kerfed and rabbeted for fast installation with less waste in standard "J" suspension system.

In short, there probably won't be another two-hour rated product with so many features in a long, long time.

Ask your Gold Bond® Representative for samples and specifications, or write Dept. PA-91, National Gypsum Company, Buffalo 13, N. Y.

Since HOPE'S *1818*

STEEL WINDOWS HAVE THE STRENGTH AND RIGIDITY THAT NO OTHER WINDOW CAN MATCH

330 BEACON STREET APARTMENTS, BOSTON, MASS.

Hugh Stubbins & Associates, Architects — *Turner Construction Company, Contractors*

A chief source of interest in this apartment building is in the arrangement of bays formed by angular window wall units. In each bedroom the large, glazed opening gives a feeling of airy spaciousness while the adjoining apartment is blocked off by its own solid wall on the interior angle. Thus all the building's 78 apartments enjoy both privacy and a view.

The window units, furnished by Hope's, are Custom Heavy Intermediate Casements and fixed sash fitted to Hope's pressed metal frames, mullions and sills. In this building as in all others using Hope's Window Walls, the benefits of labor saving installation are combined with economy of maintenance assured by Hope's superior strength and rigidity.

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STANLEY MAGIC-DOOR®

Electric

AUTOMATIC DOOR OPERATING EQUIPMENT

is economically practical for almost every type of commercial application.

This compact Electric Operator is realistically priced and easy to install. Like all STANLEY MAGIC-DOOR operators, it is ruggedly constructed and amply powered to insure years of dependable service in stores, banks, office buildings, institutions and similar establishments.

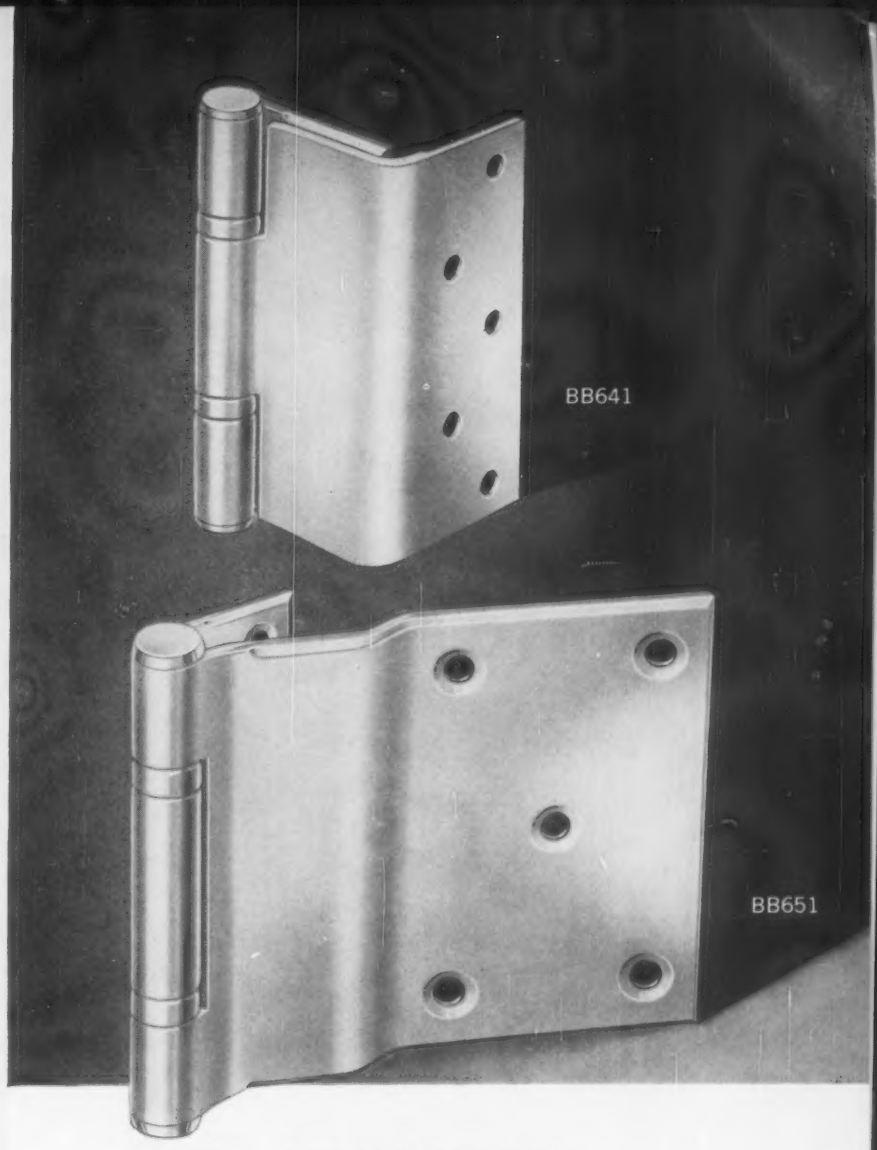
MODEL EH-1 FOR IN-THE-HEADER MOUNTING

Two models—for in-the-header mounting (EH-1) or visible mounting (EV-1)—are applicable to new or existing doors 30″ to 42″ wide. Unit provides manual release in event of power failure and is designed for economical maintenance.

3 TYPES OF OPERATORS

Stanley's **Hydraulic, Pneumatic** and new **Electric** MAGIC-DOOR Operators make up a complete line of automatic door operating equipment that provides you with the right selections for all kinds of commercial, institutional and industrial operating conditions.

See your Stanley MAGIC-DOOR Distributor for technical details or write to Stanley Hardware, Division of The Stanley Works, MAGIC-DOOR SALES, Dept. I, 78 Lake Street, New Britain, Connecticut.



SLIM SILHOUETTE...

and "SWING-CLEAR" STYLING

The modern, trim BB600 Series 3-Knuckle Ball Bearing Hinge* recently introduced by STANLEY is now also available in "Swing-Clear" Styling.

Where the attractive, trim look is desired throughout modern hospitals and institutions, you can now specify matching standard and "Swing-Clear" type template hinges with the new BB600 Series slim silhouette styling. Specify BB641 for half mortise and BB651 for full surface "Swing-Clear" Hinges with the trim, modern look.

Write for your copy of our Hospital Hardware Folder (H-157) to: Stanley Hardware, Division of The Stanley Works, Dept. I, 78 Lake Street, New Britain, Conn.

*Patents Pending

STANLEY

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CANADIAN PLANTS: HAMILTON, ONTARIO AND ROXTON POND, P.Q.

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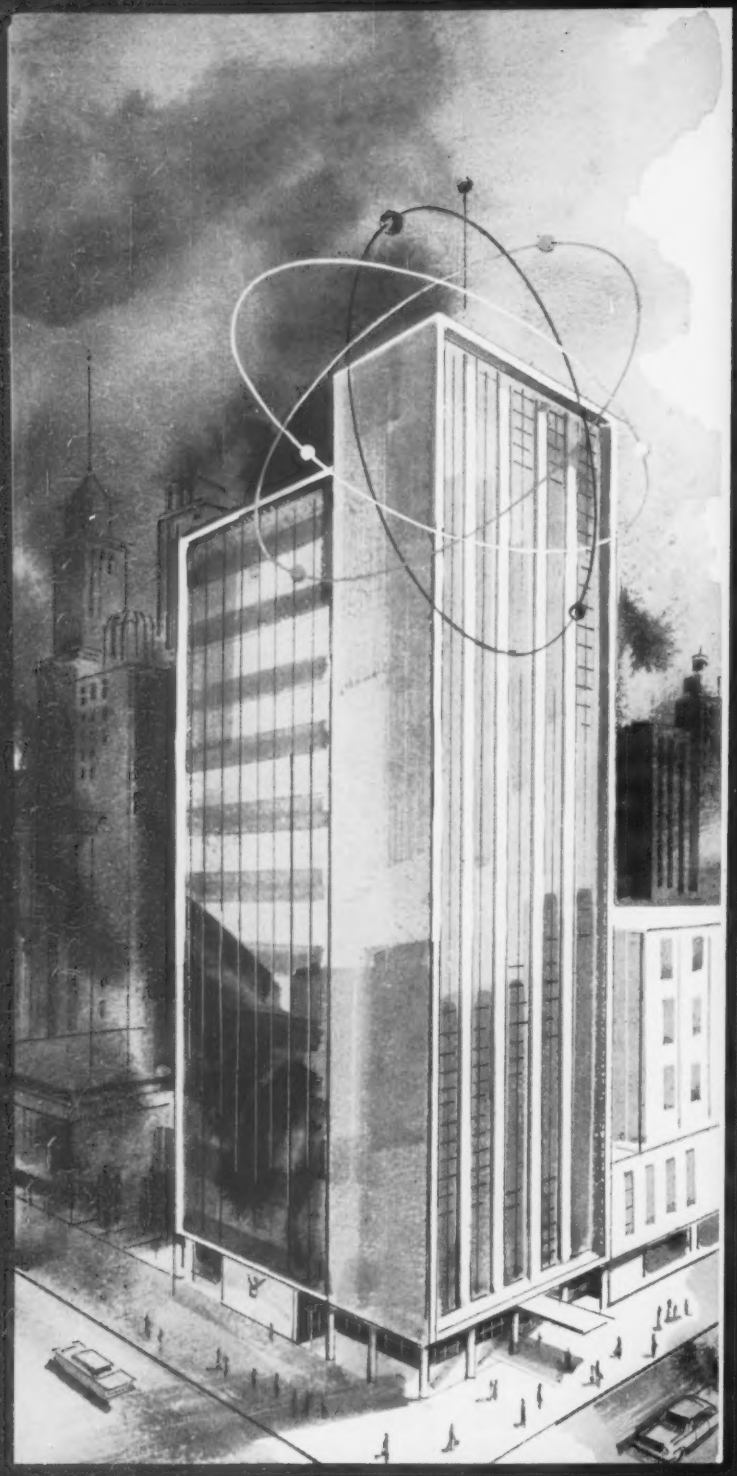


New from Haughton Elevonics*

DYNAFLITE
ELEVATOR CONTROL

The Miracle in Motion That Sets New Standards for Speed and Comfort in Vertical Transportation

Haughton Dynaflite achieves the high speeds required for efficient handling of heavy elevator traffic with *incredible smoothness.* Acceleration and deceleration are so subtle—so finely controlled—that passengers scarcely feel any motion at all. This means passenger comfort and confidence that no conventional control system can provide.

The Dynaflite system is fully automatic, thoroughly reliable. Each run is as precisely controlled as those that preceded it, and those that will follow. Haughton quality in materials and workmanship brings tight-fisted economy in upkeep, too.

Haughton Dynaflite Control is ready to serve your buildings today, thanks to Elevonics* . . . the well-spring of progress in vertical transportation for multi-floor buildings. Include Dynaflite's distinctive advantages in your building or modernization plans. Ask your Haughton representative for complete information, without obligation. Or, write today.

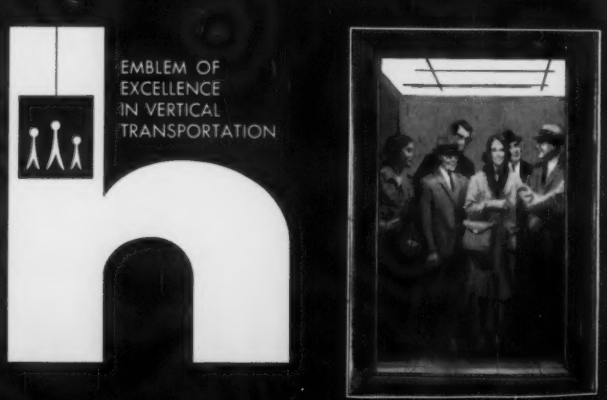
* *Haughton's advanced program in elevator systems research and engineering, with specific emphasis on the creative application of electronic devices and instrumentation for betterment of systems design and performance. Registered in U. S. Patent Office.*

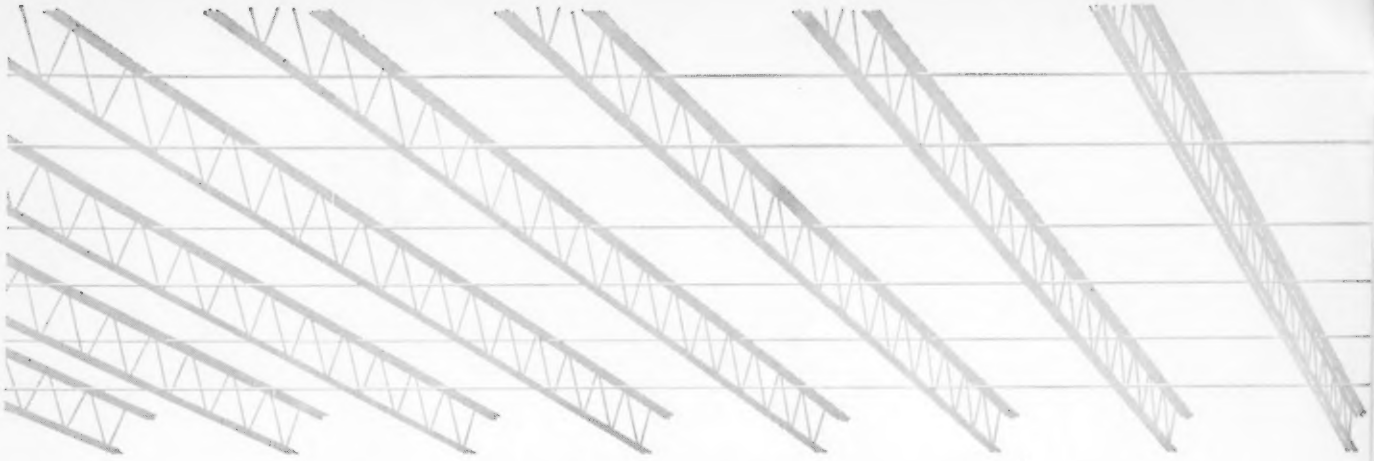
Haughton Elevator Company

Division of Toledo Scale Corporation, Toledo 9, Ohio

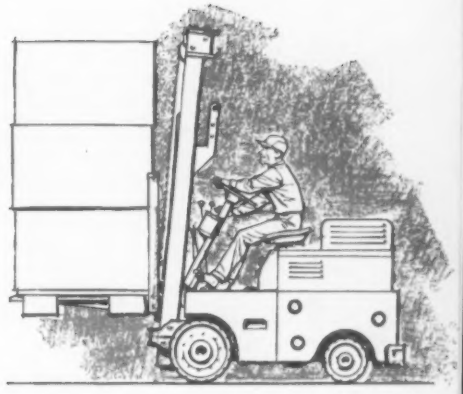
Offices in principal cities

PASSENGER AND FREIGHT ELEVATORS • ESCALATORS • DUMBWAITERS





WHAT HAPPENED TO ALL THE POSTS ?



JOISTOLOGY* ELIMINATED THEM!

In the modern school or warehouse the fewer interior supporting posts or columns, the better. Clear, unobstructed floor space means more light, flexibility and storage area.

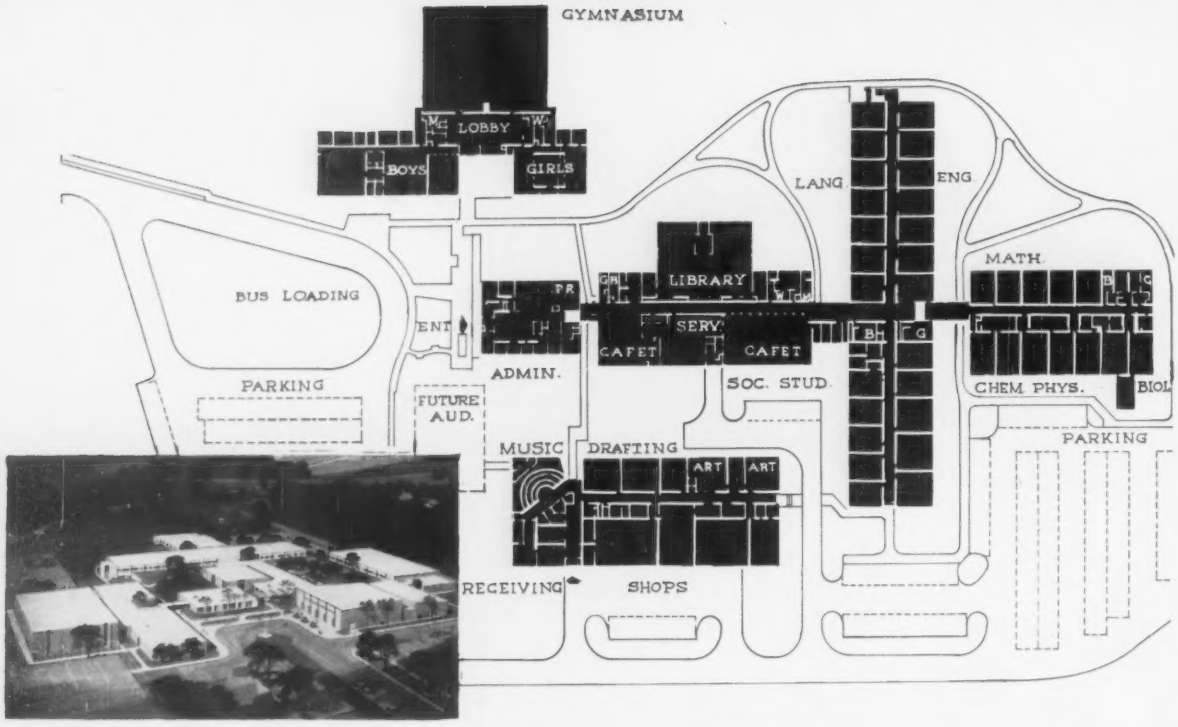
Designers, engineers and builders have found open web steel joists the practical way to span large open areas and still keep them open. These steel joists can bear heavy loads without intermediate support, with complete safety. What's more, they're lightweight, even in the largest sizes and spans, low in cost, and extremely easy to install. They adapt themselves readily to a variety of architectural styles.

Learn more about these handy structural members. Write to the Steel Joist Institute for descriptive literature on design, performance and applications.

***Joist-ol-o-gy, N.** (As Webster *should have* defined it.) The art or science of designing and building more economical structures through the use of open web steel joists. 6106

Another in a series of advertisements placed in the public interest by the STEEL JOIST INSTITUTE, Room 715, DuPont Circle Building, Washington 6, D.C.

For more information, turn to Reader Service card, circle No. 408



PLANNING THE NEW SCHOOL

This unusual new high school in Darien, Conn. has a present enrollment of 810 pupils, yet can easily be expanded to accommodate the 1200 to 1300 student population expected within five years. Architects Ketchum & Sharp, consulting engineers Cosentini Associates, and a hard working school building committee planned wisely for both present and future while keeping square foot costs below those of Darien schools built in 1948 and 1951.

General Contractor – Deering Construction Company

Electrical Contractor – Wilton Electric, Inc.

AT DARIEN... the need for an efficient Electronic Time Control and Program system, free of operation and maintenance problems lead to the selection of Stromberg. Dependably correct clocks and signals are assured by the precision Master Time Control which automatically supervises secondary units hourly, as well as at 12 hour intervals – *and* program signals are immediately corrected following a power failure. These synchronizing signals operate on ordinary lighting circuits – require no spécial wiring; all correction cycles are completed in only 60 seconds. Stromberg's exclusive seven-channel transmitter may be arranged with one frequency for clock supervision and the other six for program signals; this program unit will handle as many as 1440 signals daily on each circuit and is fully modular in that channels can be added as needed without new wiring costs.

Stromberg Automatic Remote Control Center, in any standard Stromberg installation, will control all clocks and audible signals, as well as automatically program the "on-off" of lighting centers, heating and air conditioning and ventilating for optimum cost efficiency. *And* – manual controls permit temporary changes at any time without interference with the basic schedule.

Stromberg offers installation and maintenance service throughout U.S.A. and Canada.

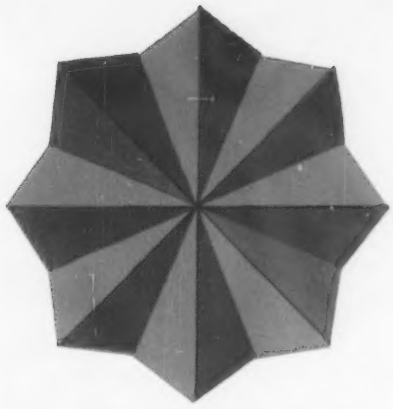
A complete catalog – TIME AND SIGNAL EQUIPMENT – prepared for Architects and Engineers – is yours for the asking.

STROMBERG DIVISION

GENERAL TIME CORPORATION

THOMASTON, CONNECTICUT

For more information, turn to Reader Service card, circle No. 352



In today's most unconventional roof designs...

New NEOPRENE–HYPALON® roofing systems assure lasting beauty and protection

Imaginative roof designs, embodying geometric forms of every shape and contour, are today being made practical by neoprene and HYPALON—a pair of versatile Du Pont synthetic rubbers.

By providing workable solutions to many problems of modern roof construction, these new roofing systems free the architect from limitations imposed by conventional materials. Easily applied over almost any commonly used substrate, they cure into tough, elastic, weathertight films having exceptional resistance to ozone and weathering as well as oils and chemicals, abrasion and *flame*.

Moreover, they retain these properties despite continual outdoor exposure, neither soften with heat nor embrittle with cold, expand and contract with the roof deck. As a roofing system, neoprene provides low-cost film build-up; HYPALON, a wide choice of stable, attractive topcoat colors. Separately or in combination, resilient neoprene and HYPALON assure lasting protection with minimum upkeep.

Du Pont produces only the elastomers, neoprene and HYPALON; not the finished roofing materials themselves. For a list of suppliers and our booklet, "Colorful, Durable Roof Coatings Made with Neoprene and HYPALON," just fill in and mail the coupon. There is no obligation whatsoever. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. PA-5, Wilmington 98, Delaware.

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ELASTOMERS FOR ROOFING

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BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

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Elastomer Chemicals Department PA-9
Wilmington 98, Delaware

Please send me by return mail the booklet, "Colorful, Durable Roof Coatings Made with Neoprene and HYPALON," plus list of suppliers.

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Firm_____

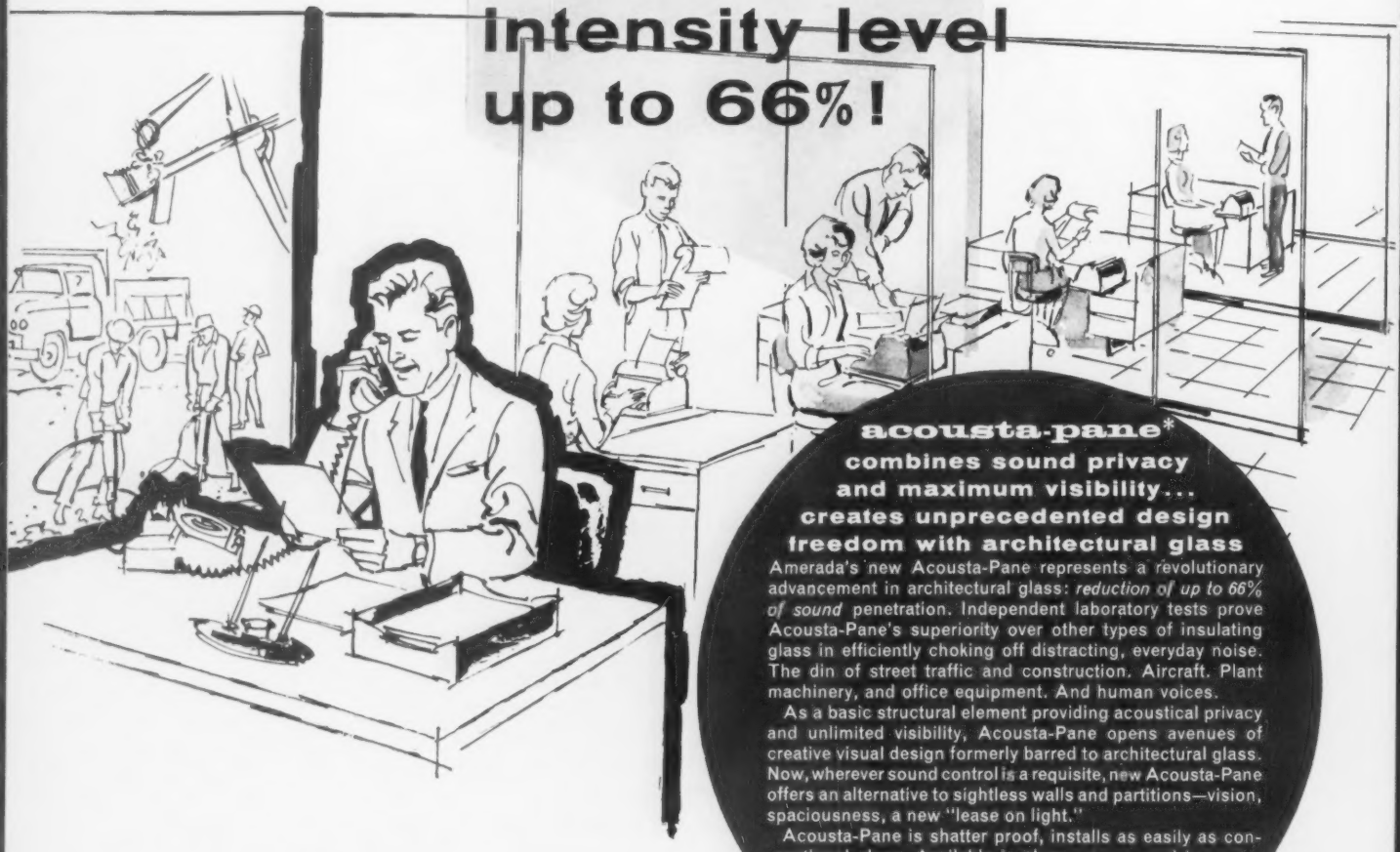
Street_____

City_____ Zone_____ State_____

For more information, turn to Reader Service card, circle No. 343

now glass controls sound!

new acousta-pane* reduces noise intensity level up to 66%!



acousta-pane* combines sound privacy and maximum visibility... creates unprecedented design freedom with architectural glass

Amerada's new Acousta-Pane represents a revolutionary advancement in architectural glass: *reduction of up to 66% of sound* penetration. Independent laboratory tests prove Acousta-Pane's superiority over other types of insulating glass in efficiently choking off distracting, everyday noise. The din of street traffic and construction. Aircraft. Plant machinery, and office equipment. And human voices.

As a basic structural element providing acoustical privacy and unlimited visibility, Acousta-Pane opens avenues of creative visual design formerly barred to architectural glass. Now, wherever sound control is a requisite, new Acousta-Pane offers an alternative to sightless walls and partitions—vision, spaciousness, a new "lease on light."

Acousta-Pane is shatter proof, installs as easily as conventional glass. Available in clear, opaque and in grey or blue tint.

Send for our free brochure on this dramatic new concept of sound control.

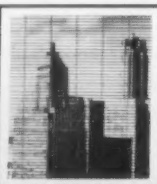
amerada
GLASS CORPORATION

Beauty and function . . . tomorrow's glass today!

Other Unique Amerada Products Available at Leading Glass Distributor Outlets

Twi-Lite*

Greyed laminated safety glass reduces solar energy 30-40% more efficiently than clear glass, eliminates need for costly shading devices.



Comfor-Lite*

Hundreds of minute louvers between 2 hermetically-sealed glass panes screen out heat and glare without obstructing visibility.

For more information, turn to Reader Service card, circle No. 319

* TRADE MARK

amerada GLASS CORPORATION
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Gentlemen:
Please send me your free color brochure on new Acousta-Pane at no obligation.

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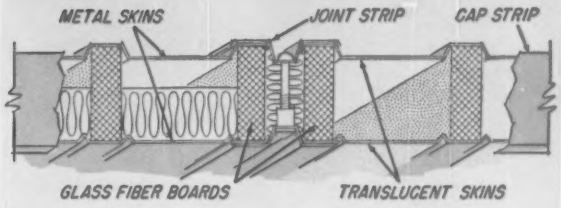
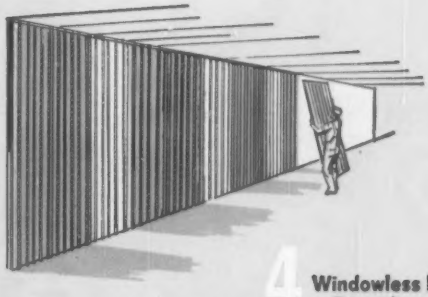
Include information on ☐ Twi-Lite ☐ Comfor-Lite

1 Wide module—Condo-panels are 32" in width. This is 8" to 20" wider than comparable metal curtain wall panels now available. Panels are completely pre-assembled. These factors mean faster erection, construction more nearly monolithic, fewer vertical joints. Available in lengths to 20' and thicknesses of 2", 3" and 4".

2 Low U-factors—U-factors range from .12 to .16—and these are conservative ratings that embrace all types of heat transfer through the walls, including joints.



3 High strength/weight ratio—Panels are light in weight (as little as 1.8 lbs. per sq. ft.), span up to 13 feet for a 20 lb. wind load, and can be stacked vertically. Ribs on 4½" centers provide both texture and rigidity.



4 Windowless light—Panels with translucent plastic skins are completely interchangeable with aluminum or steel panels... enable the designer to turn whole wall areas into windowless, insulating natural light sources.

New CONDO-WALL offers FOUR BASIC DESIGN IMPROVEMENTS in windowless curtain wall

Whatever the nature of the curtain wall job now on your board, you are invited to compare the features of Condo-wall with those of any other insulating panel. Before you specify that enclosure, call us collect in Columbus, Ohio—Area code 614 AXminster 9-2123, for literature and the name of our nearest representative. Ask for Martin Winter.

DRESSER-IDECO COMPANY
875 MICHIGAN AVENUE • COLUMBUS 15, OHIO

DRESSER IDECO® DRESSER INDUSTRIES INC.
ELECTRONIC • INDUSTRIAL
OIL • GAS • CHEMICAL

DETAILED IN SWEET'S ARCHITECTURAL FILE $\frac{3a}{dr}$ *Complete literature on request*

For more information, turn to Reader Service card, circle No. 422

PELLA PRODUCTS THE FOCAL POINT OF QUALITY

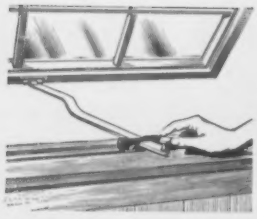
Pella®

wood multi-purpose windows

offer flexibility for good design

PELLA WOOD MULTI-PURPOSE WINDOWS open creative planning possibilities when you work with extensive glass areas. 20 ventilating and fixed unit sizes provide almost limitless arrangements, all accented by handsomely proportioned mullions. For textural harmony, the quality wood frames of PELLA M-P WINDOWS blend easily with glass, stone and other surfaces. M-P WINDOWS also offer all-weather efficiency and reduced maintenance with such standard features as self-storing screens and storms, stainless steel weatherstripping and the exclusive GLIDE-LOCK® underscreen operator. Full specifications in SWEET'S. Consult the classified telephone directory for name of your nearest U. S. or Canadian distributor. ROLSCREEN COMPANY, PELLA, IOWA.

THETA TAU FRATERNITY, MINNEAPOLIS ARCHITECTS: McENARY & KRAFFT



UNDERSCREEN OPERATOR is of extruded aluminum. Exclusive nylon GLIDE-LOCK® permits locking M-P window in 10 positions.

PELLA ALSO MAKES QUALITY WOOD CASEMENT WINDOWS, WOOD FOLDING DOORS AND PARTITIONS, ROLSCREENS AND WOOD SLIDING GLASS DOORS

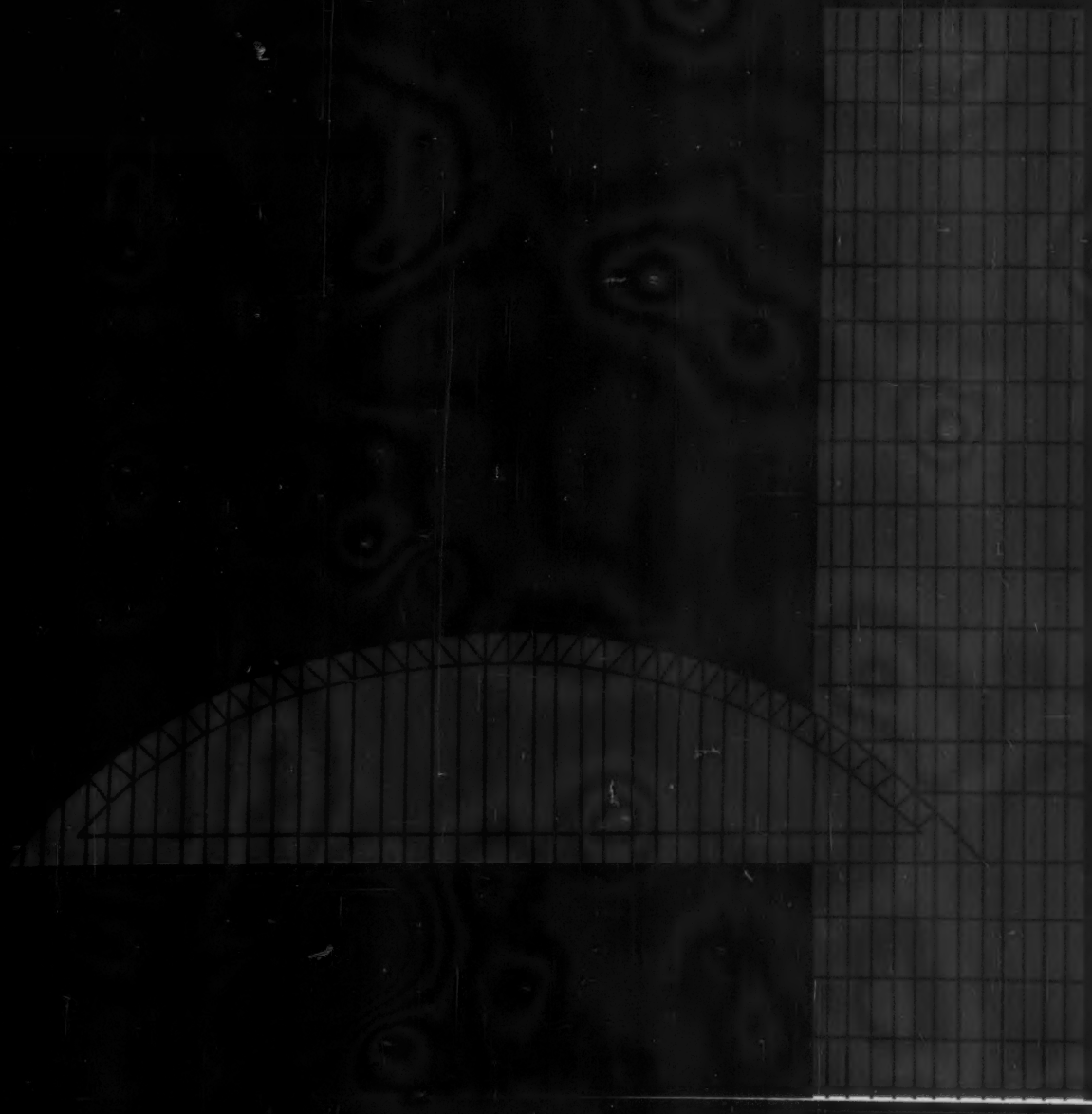
Take a good look at what you can do with the complete family of USS Design Steels

Over the past 50 years, the steel industry has developed at least 10,000 new steels! Many of these steels have been proved thoroughly on the job and wait only for the design magic of the right engineer, the right architect or the right designer to put them to use in stronger, safer and more economical structures.

Designers of buildings and bridges now have a whole "family" of USS Structural Carbon Steels, High Strength Steels and Constructional Alloy Steels available in the necessary shapes with minimum yield points ranging from 32,000 psi to 100,000 psi.

Several bridges and buildings have already been built combining these various steels into one structure to obtain maximum strength, light weight and economy—but all kinds of interesting developments lie ahead. It should be a challenge to designers to get the most out of every steel!

USS United States Steel



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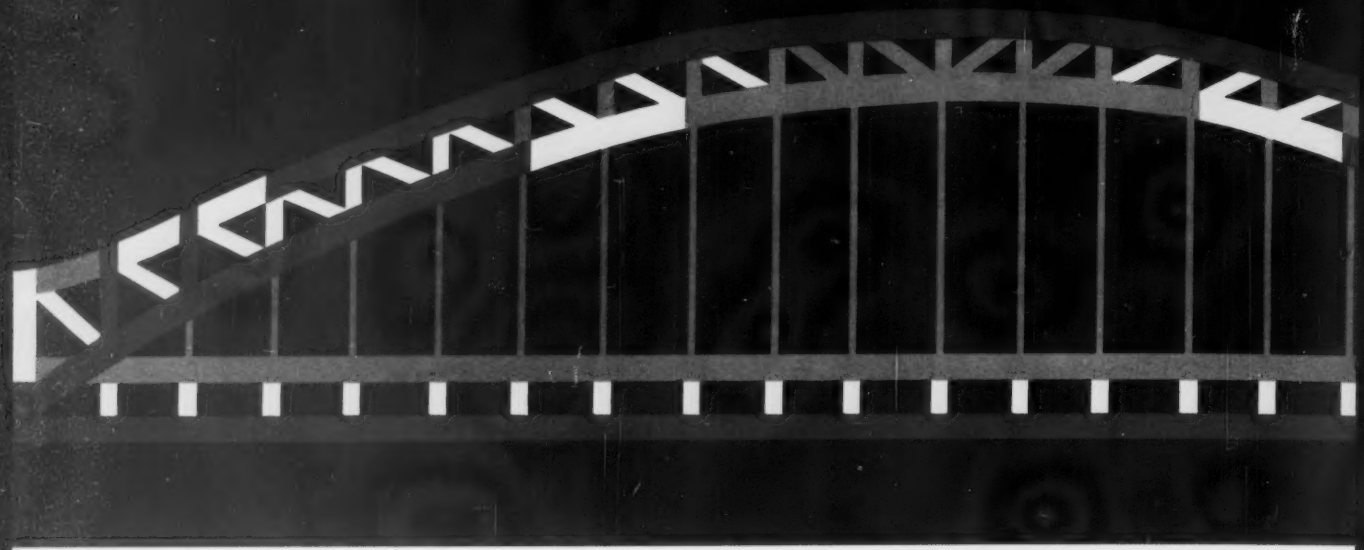
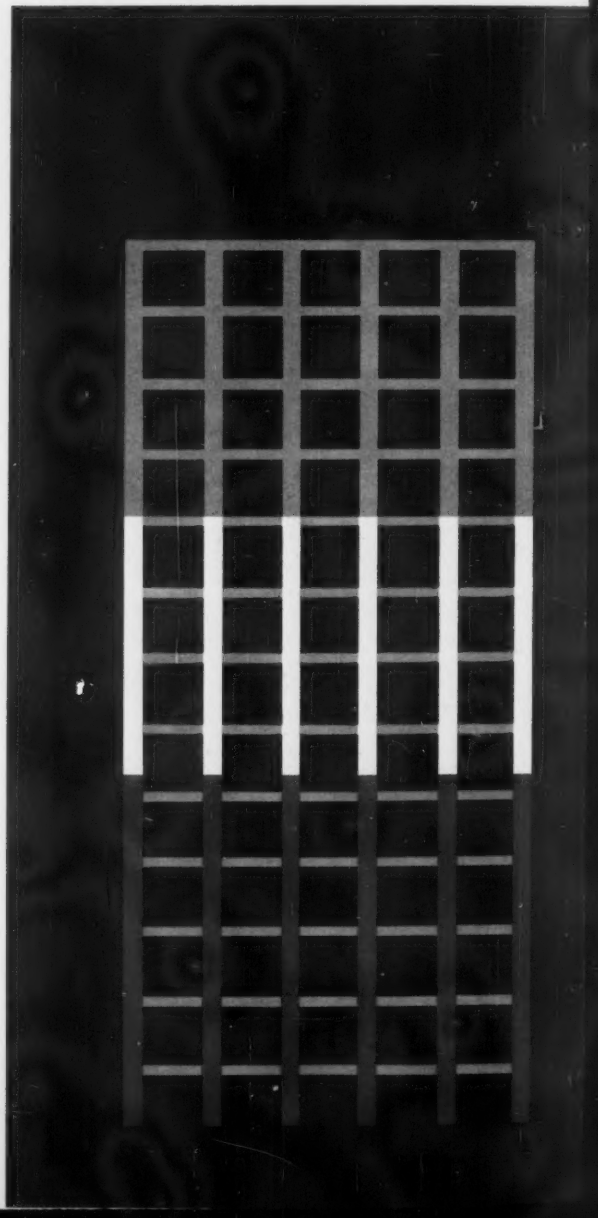
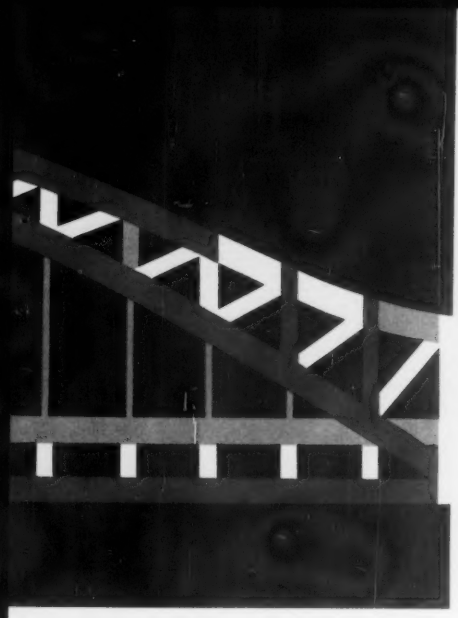


New concept of design for buildings and bridges—get the most out of the family of steels by using them wherever they will improve design, reduce weight or effect over-all savings in construction.

USS Design Steels that do the most to reduce construction costs



This mark tells you a product is made of modern, dependable Steel.



Red—USS "T-1" Constructional Alloy Steel (100,000 psi minimum yield point)

White—USS MAN-TEN High Strength Steel (ASTM A440—50,000 psi minimum yield point)

Gray—USS Structural Carbon Steel (ASTM A36—36,000 psi minimum yield point or A7—33,000 psi minimum yield point)

Pound for pound, these stronger steels shoulder heavier loads . . . or they reduce the size and weight of structural members and foundations. They add valuable floor space to buildings, reduce freight costs and result in faster erection with earlier occupancy . . . all money-saving advantages.

New design concepts are emerging that challenge the designer's imagination and ingenuity. The combining of many steels to get the most out of them has long been practiced by automotive engineers and some other designers. It has given us the best automobiles, the highest television towers in the world, the largest earth-moving equipment and giant radio telescopes.

ASTM A7 Structural Carbon Steel is a mighty versatile and potent metal. No other material so strong (minimum yield point 33,000 psi) and selling at a material cost of less than 10 cents a pound, can be drawn, welded, forged, riveted, punched, and painted so readily and safely. A more weldable carbon steel (A373) has a minimum yield point of 32,000 psi.

ASTM A36 Structural Carbon Steel. The higher yield point of 36,000 psi and the low price indicate that this important new steel may become the predominant structural grade, and that it may displace A373 in welded construction. A36 steel gives the designer the opportunity to provide lighter-weight structures at a low cost. It has been accepted for both building and bridge construction at a basic allowable design stress 2,000 psi higher than A7 steel (20,000 allowable design stress for bridges, 22,000 for buildings). It can be used for riveted, bolted and welded fabrication.

USS High Strength Steels

All have minimum yield points of 50,000 psi. Each has specific area applications where it will do the very best job.

USS MAN-TEN Steel (A440) is a high-strength carbon steel intended for riveted and bolted construction. It is the most economical of the high-strength steels; has good workability, high resistance to abrasion, and atmospheric corrosion resistance double that of plain carbon steel. Since it provides a yield point 50% higher than A7 steel, engineers can design with higher unit working stresses and achieve *real* reductions in steel size, weight and costs.

USS TRI-TEN Steel is a high-strength low-alloy steel intended primarily for use in welded construction. This steel meets all requirements of ASTM A441. It provides greater toughness, even at low temperatures, and has twice the atmospheric corrosion resistance of carbon steel. TRI-TEN Steel has been widely used for bridges, buildings, machinery and railroad equipment to reduce weight and costs or to provide increased strength and load capacity without increased weight.

USS COR-TEN Steel is recommended for all applications in which relatively high resistance to atmospheric corrosion is considered necessary. It permits the use of thinner sections to take advantage of the increased strength of the material, or the use of equal or heavier thickness for extended life *with or without protective coating*. Paint lasts up to twice as long on COR-TEN Steel as it does on carbon steel.

USS "T-1" Constructional Alloy Steel. This is the "superman" of structural steels with a minimum yield strength of 100,000 psi. It is furnished quenched and tempered and is readily weldable. It has four to six times the atmospheric corrosion resistance of structural carbon steel and possesses exceptional toughness over a wide range of temperatures down to −50°F. "T-1" Steel combined with USS TRI-TEN High-Strength Low-Alloy Steel and carbon steel has already been used in a number of bridges. In Carquinez Strait Bridge in California, it saved $800,000 with big savings in weight. This led to its use in Martinez Bridge nearby, Louisville-New Albany, Whisky Creek and others under design. "T-1" Steel is available in standard structural shapes as well as bars, semi-finished and sheets.

USS "T-1" type A Constructional Alloy Steel. This is a lower-priced steel with the same high yield strength of 100,000 psi in thicknesses up to 1 inch. It can be used in highly stressed members to obtain maximum strength, with reduced size, weight and costs. It is available in the same shapes as "T-1" Steel.

For more information on any of these USS Steels, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS, "T-1," MAN-TEN, TRI-TEN, and COR-TEN are registered trademarks.

United States Steel Corporation • Columbia-Geneva Steel Division • Tennessee Coal & Iron Division • United States Steel Supply Division • United States Steel Export Company

United States Steel

USS

Now Available...

QUENCHED AND TEMPERED STRUCTURAL SHAPES

in such grades as "T-1", "T-1" type A, 9% Nickel and HY-80 Constructional Alloy and Armor Steels

Announcing another industry "first" for United States Steel—USS Quenched and Tempered Alloy and Armor Steel Structural Shapes are now commercially available for the first time anywhere, in the types and sizes shown in the accompanying tables. The more commonly used sizes of Wide Flange Beams, American Standard Beams, Channels, Equal Angles and Unequal Angles will be produced in these USS Steels: "T-1", "T-1" type A, 9% Nickel, HY-80 and certain other alloy grades that provide desirable mechanical properties after quenching and tempering. Later, other sizes and shapes will be added according to demand.

These quenched and tempered alloy and armor steel structural shapes (see table below) can simplify design and result in substantial weight savings, increased structural strength and reduced shipping and handling costs. For a free folder about any of these steels or their structural shapes, contact your local USS representative or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. USS and "T-1" are registered trademarks.

United States Steel Corporation • Columbia-Geneva Steel Division • Tennessee Coal and Iron Division • United States Steel Supply Division • United States Steel Export Company

Availability Quenched and Tempered standard structural shapes are available in the following shapes and sizes:

I	Beams: 8″ to 16″ inclusive	Selected Wide Flange Sections and Foot Weights*
I	Beams: 6″ to 12″ inclusive	American Standard Sections and Foot Weights*
[	Channels: 6″ to 15″ inclusive	American Standard Sections and Foot Weights*
L	Equal Angles: 3″ to 8″ inclusive	Standard Sections*
L	Unequal Angles: 3½″ x 3″ to 8″ x 6″ inclusive	Standard Sections*

*See our booklet, "USS Shapes & Plates," ADUCO-27001

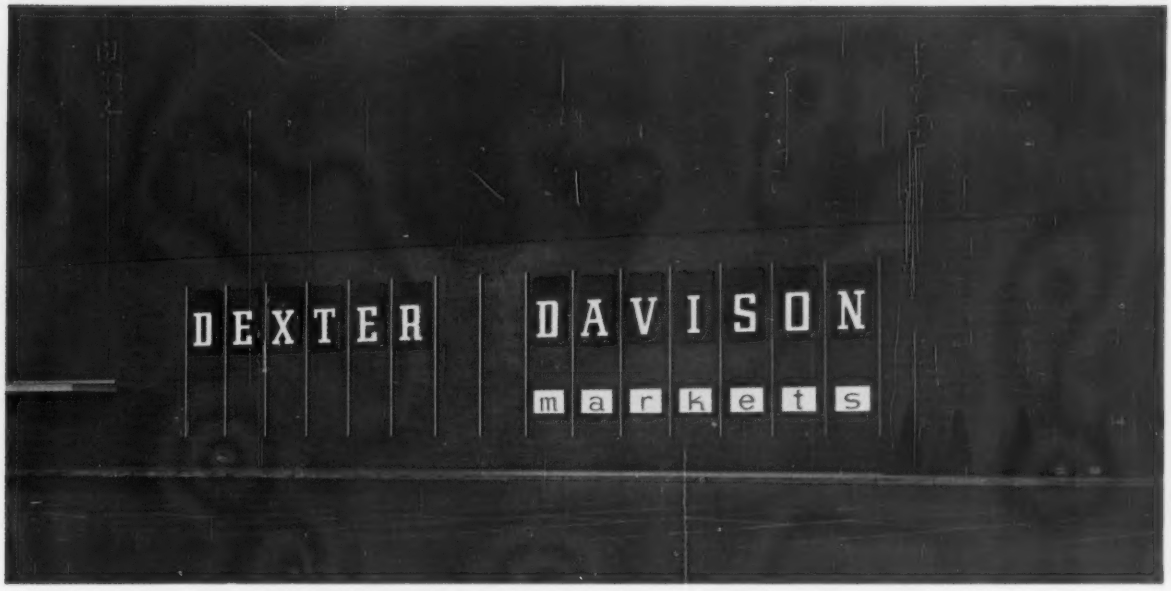
Maximum length 40′ for all sections

Mechanical Properties of Quenched and Tempered Alloy and Armor Steel Structural Shapes

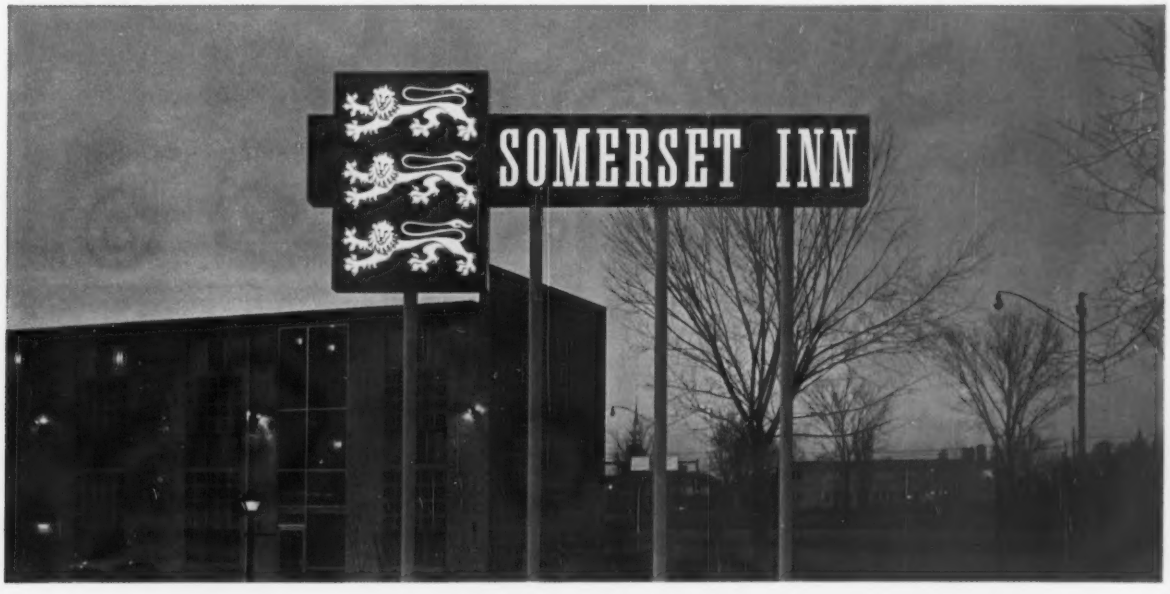
	Yield Strength, psi	Tensile Strength, psi	Elong. in 2″, % min.	Reduction of Area, % min.	Longitudinal Charpy Impact (when specified)	
					Keyhole	V-notch
"T-1" Steel 2½″ and Under	100,000 min.	115,000/140,000	18	55①	15 ft.-lbs. @ −50F	30 ft.-lbs. @ +10F
"T-1" type A 1″ and Under	100,000 min.	115,000/140,000	18	55①	15 ft.-lbs. @ −50F	—
Grade A 9% Nickel	60,000 min.	90,000 min.	22% min.	—	15 ft.-lbs. @ −320F	20 ft.-lbs. @ −320F
Grade B 9% Nickel	65,000 min.	95,000 min.	20% min.			
HY-80 ¼″ 2″ Incl.	80,000/100,000②	—	19③	—	—	70 ft.-lbs. @ −120F

①¾″ and under—45% min.
②½″ and over, yield strength range is 80/95,000 psi
③½″ to 2″ inclusive, elongation 20% min.

USS United States Steel



Sign your client's name in Plexiglas



There are good reasons why more and more architects think in terms of PLEXIGLAS® acrylic plastic for the signs that mark their clients' buildings. PLEXIGLAS makes possible designs that are based on *areas* of color and light. Lighting is transmitted from behind the translucent material—signs are clean and legible by day, completely luminous at night. A full spectrum of aesthetically pleasing colors is available. In addition, PLEXIGLAS signs resist weather and breakage, are economical to maintain.

Well designed buildings deserve attractive signs. Let us put you in touch with sign companies who are experienced in working with PLEXIGLAS.

ROHM & HAAS

PHILADELPHIA 5, PA.

In Canada: *Rohm & Haas Co. of Canada, Ltd., West Hill, Ontario*

WRITE FOR NAMES OF SIGN MANUFACTURERS WHO SPECIALIZE IN PLEXIGLAS

For more information, turn to Reader Service card, circle No. 399

Which architect wrote the best air-conditioning spec?

The one who wrote: *". . . air-conditioning equipment to be supplied and installed under these specifications shall be certified under the Air-Conditioning & Refrigeration Institute Certification Program, as complying in all requirements with ARI Standard 210-58, or ARI Standard 250-58."*

Here's why: Any equipment* bearing the ARI Seal of Certification assures the architect that the equipment will produce the cooling capacity claimed. To be granted the Seal, a manufacturer must rate his equipment in standard Btu per hour instead of the confusing and less accurate "horsepower." Qualified equipment is subject to random selection from stock for intensive checking and verification in an independent testing laboratory under adverse conditions, with emphasis on wilting heat and high humidity.

Specify *ARI-Certified* for complete assurance that the unitary equipment you require will deliver its full rated cooling capacity, and continue to deliver ample capacity under adverse conditions.

Participating manufacturers covered by the Certification program, and their unit lines, are named in a directory which is available upon request without charge from Department P-911

*"Unitary" air conditioners included in this program: all packaged air conditioners, whether single units or two-piece units (called "split" systems), up to 135,000 Btuh in capacity, but not including room air conditioners. ARI Standard 210-58 for electrically-driven equipment; ARI Standard 250-58 for heat-operated equipment.

AIR-CONDITIONING AND REFRIGERATION INSTITUTE
1346 Connecticut Avenue, N.W.
Washington, D. C.

Manufacturers participating in this program as of January 1, 1961: • Airtemp Division, Chrysler Corporation • Albion Division, McGraw-Edison Company • Amana Refrigeration, Inc. • American Furnace Company • American-Standard Industrial Division, American Radiator and Standard Sanitary Corporation • Arkla Air Conditioning Corporation • Armstrong Furnace Company, Division of National Union Electric Corporation • Bryant Manufacturing Company • Carrier Air Conditioning Company • Cleveland Steel Products Corporation, Toridheet Division • Cobell Industries Incorporated • The Coleman Company, Inc. • Crane Co., Air Conditioning & Refrigeration Division • Curtis Manufacturing Company • Day & Night Manufacturing Company • Fraser & Johnston Company • Friedrich Refrigerators, Incorporated • Gaffers & Sattler, Division of Utility Appliance Corp. • General Electric Company • Goettl Bros. Metal Products Inc. • Holly-General Company, Division of the Siegler Corporation • International Metal Products Division, McGraw-Edison Company • Janitrol Heating and Air Conditioning, A Division of Midland Ross Corporation • Lennox Industries Incorporated • Lincoln Air Control Products, Inc. • The Mathes Company, Division of Glen Alden Corporation • Mission Appliance Corporation • Montgomery Ward • Mueller Climatrol, Division of Worthington Corporation • National Thermatic Corporation • The Payne Company • Peerless Corporation • Perfection Division, Hupp Corporation • Pioneer Industries, Division of Almar York Co., Inc. • Rheem Manufacturing Company • Round Oak Division of Peerless Corporation • Southwest Manufacturing Company • Stewart-Warner Corporation • Therm-Air Manufacturing Company • The Trane Company • Typhoon Air Conditioning Division, Hupp Corporation • United States Air Conditioning Corporation • Welbilt Air Conditioning and Heating Corp., Subsidiary of Welbilt Company • Westinghouse Electric Corporation • Williams Oil-O-Matic Heating Company, Division of National Union Electric Corporation Worthington Corporation • Wright-Temp Manufacturing Company, Division of Wright Manufacturing Company • York Corporation, Subsidiary of Borg-Warner Corporation • Zink, John, Company

Award Walls

with STARK

SCULPTURED STRUCTURAL GLAZED TILE

The recent Stark Sculptured Tile Contest for Architects and Contractors resulted in hundreds of imaginative adaptations and uses for Sculptured Structural Glazed tile.

Several of the winning *entries are combined in this illustration. One is a unique overall wall pattern using Stark's "Classic" design tile along with regular units. Another award idea used the same "Classic" design, combined with brass inserts throughout a complete series of church "furniture."

This nationwide contest again pointed out the almost limitless design possibilities of the only structural unit that offers inherent strength, pattern, economy and a glazed finish for beauty and minimum maintenance.

New . . . Now Available . . . Design Ideas—8-page sketchbook of design suggestions by leading architects showing unique and dramatic installations of Sculptured Structural Glazed Tile. Send for your copy today!

*Judging panel consisted of two registered Architects and a leading Contractor—Cleveland, Ohio. Names of judges and contest winners available on request.

STARK

STANDARD SCULPTURED STARKUSTIC

CERAMICS, INC.
CANTON 1, OHIO

"For information turn to reader service card-circle No. 301"

if she takes pride
in her home—

give her a kitchen
of stainless steel

McLOUTH STAINLESS STEEL—the spotless metal for homes and home products.

McLouth Steel Corporation
Detroit 17, Michigan

Robert A. Little designs for Open World apartment living

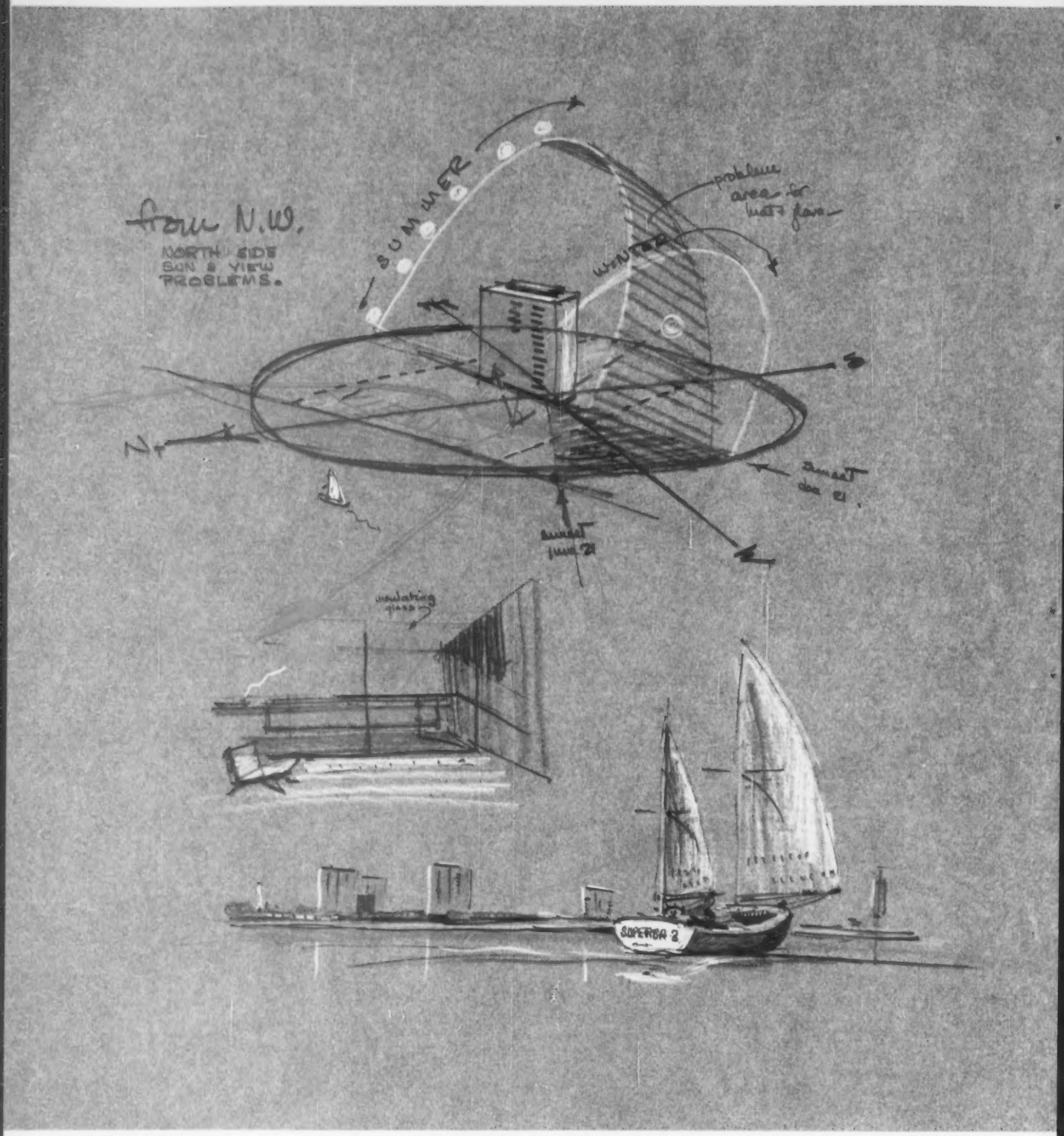
Urban revitalization, and the desire of many exurbanites to move back to the city, has placed new emphasis on apartment-house design. These people are used to spaciousness, sunlight and a view of the open world around them. They want city conveniences, but don't want to be closed in.

L·O·F commissioned Mr. Little, AIA of Robert A. Little & George F. Dalton & Associates, Cleveland, to experiment with apartment-house design to determine how L·O·F glass could help meet these requirements. His suggestions are both delightful and practical, as you will discover by studying his notes and rough sketches on this and following pages.

LIBBEY · OWENS · FORD
Toledo 1, Ohio

FIRST SKETCHES consider the site on the south shore of Lake Erie in Cleveland. Sun and view angles, traffic, and land contours are basic factors affecting design. A schematic apartment plan and building form begin to emerge. Sketch of lounge shows view through glass wall to the lake. Low afternoon summer sun suggests L·O·F Heat Absorbing or *Parallel-O-Grey*® polished plate glass.

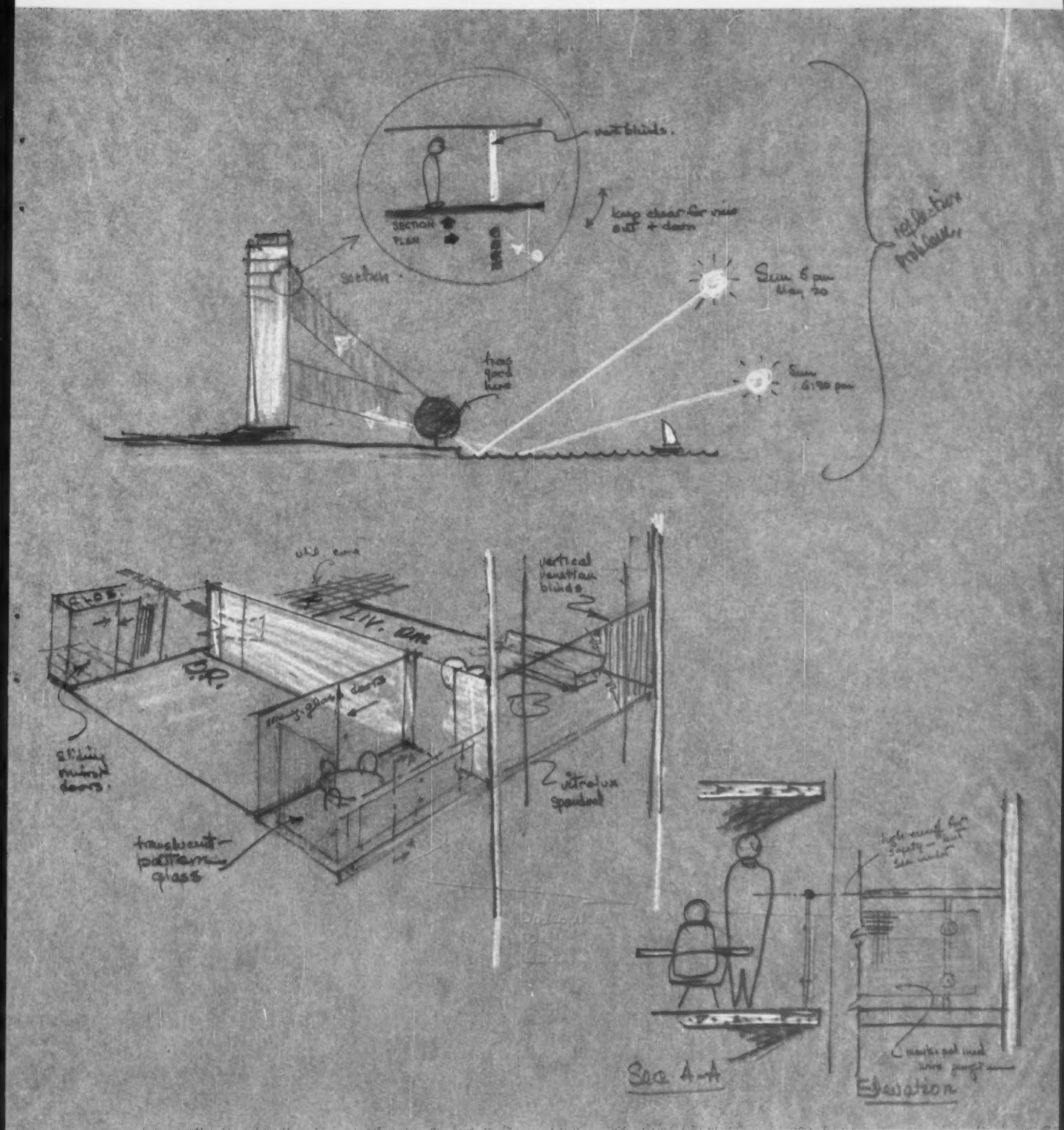
MADE IN U.S.A.
L·O·F GLASS



DETAILED PROBLEMS of sun control . . . heating and air-conditioning economies . . . and views at different times of the year are studied. The high-rise buildings are planned with broad expanses of *Thermopane*® insulating glass (with grey plate as outer pane for windows and sliding glass doors) on north and south exposures; narrow, solid walls face the east and west.

MADE IN U.S.A.

LOF GLASS®



INDIVIDUAL APARTMENT is developed to take full advantage of outlook and orientation. Problems of reflection are considered. Balcony, placed off bedroom, allows unobstructed view from living room. Balcony railing suggests L·O·F wired glass for maximum transparency and safety. Mirror sliding closet doors increase the bedroom's apparent size.

MADE IN U.S.A.

L·O·F GLASS

L·O·F GLASS FOR APARTMENTS

POLISHED PLATE GLASS

Parallel-O-Plate®
Twin ground for windows and mirrors

Parallel-O-Grey®
Tinted plate glass

Heat Absorbing Plate
Blue-green color

INSULATING GLASS

Thermopane®

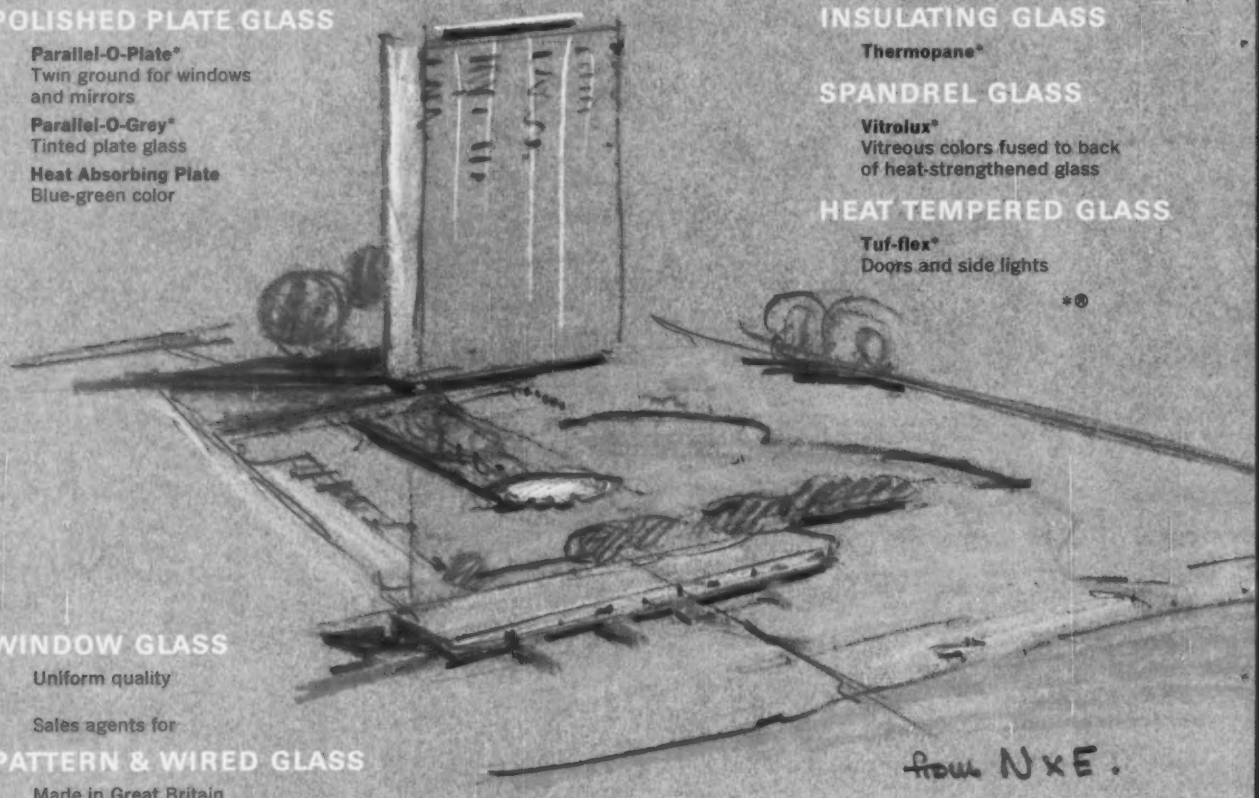
SPANDREL GLASS

Vitrolux®
Vitreous colors fused to back of heat-strengthened glass

HEAT TEMPERED GLASS

Tuf-flex®
Doors and side lights

*®



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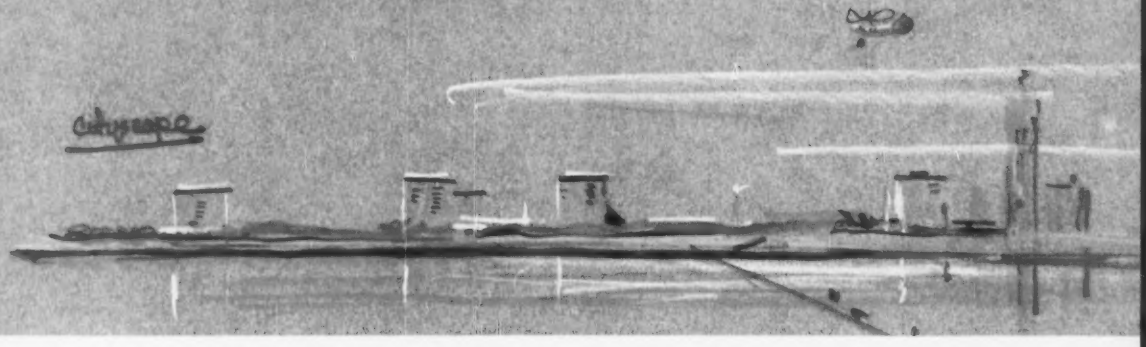
For information on these L·O·F products, refer to Sweet's Architectural File 26A, or call your L·O·F distributor or dealer, listed under "Glass" in the Yellow Pages. Or write to Libbey·Owens·Ford Glass Co., 811 Madison Ave., Toledo 1, Ohio.

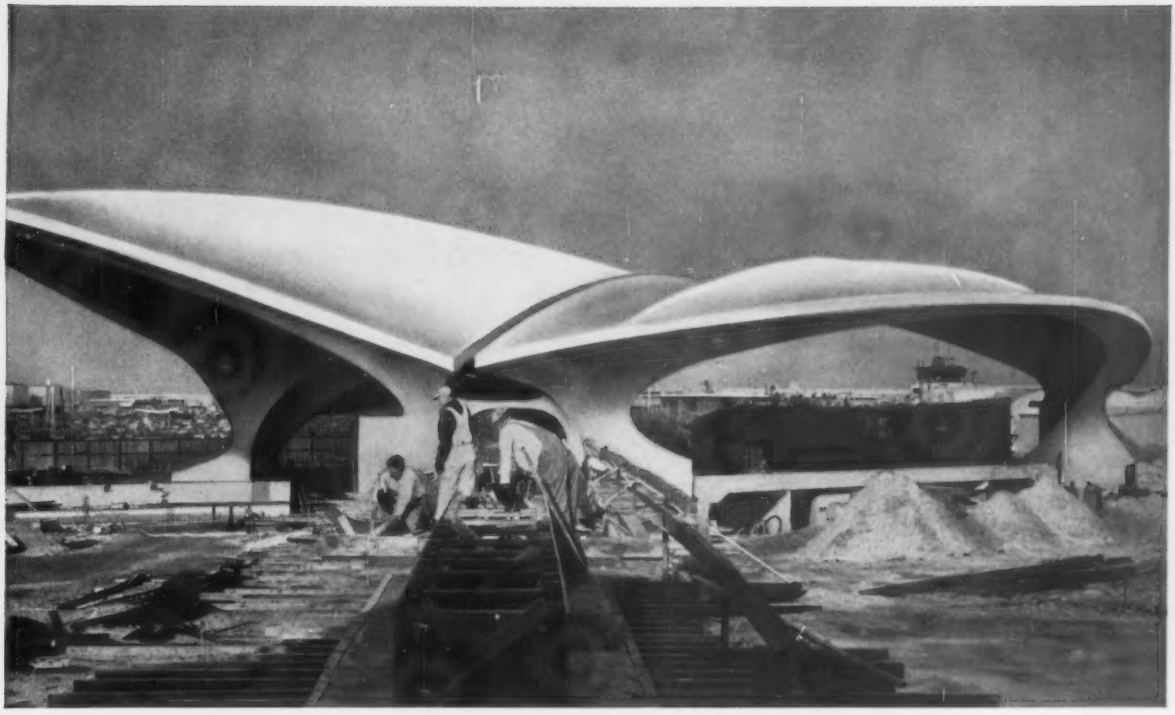


COMPOSITE AIR VIEW shows high-rise apartments looking across site to lake. Two-story terrace houses with individual walled gardens are in the foreground. Study of glass towers seen from the water considers skyline of project as part of cityscape. Reflections of sky and lake are uninterrupted in the complete glass face of *Vitrolux®* polished plate glass spandrels and windows.

MADE IN U.S.A.

L·O·F GLASS®

Litho in U.S.A.



Architect: Eero Saarinen & Associates
Consulting Engineer: Ammann & Whitney
General Contractor: Grove, Shepard, Wilson & Kruge, Inc.

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For structures of every type, creative architects know that monolithic reinforced concrete provides greater opportunity for individuality in building design and construction.

Suggestive of a huge bird poised for take-off, the new TWA Terminal Building at Idlewild Airport is a testimonial to the flexibility of this construction method. Its huge concrete shell roof is an arch cantilever design in four continuous monolithic reinforced concrete sections.

On your next project, design with greater freedom —design for monolithic reinforced concrete.

Concrete Reinforcing Steel Institute
38 South Dearborn Street
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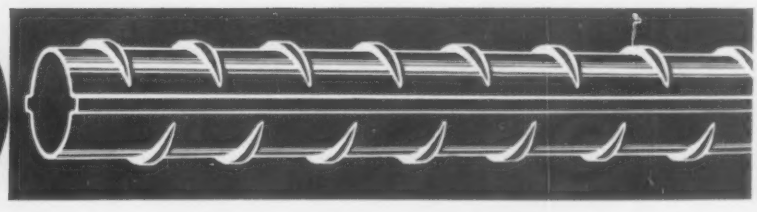

2-61

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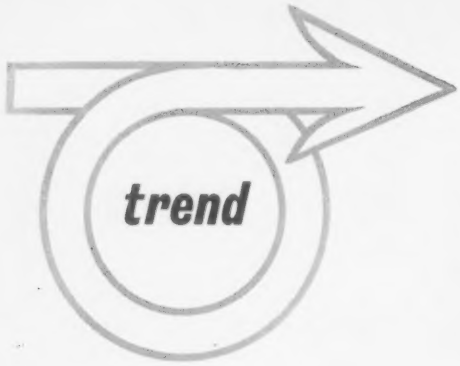

You may have already noticed it. More and more banks—large and small, in the cities and in the towns—are being built with marble. The fact is, if you purposely set out to produce a structural material to reflect the significance of banking enterprise, you couldn't approach the character of marble. There is nothing comparable. It is beauty and stability and dollars and sense economy.

There lies the paradox—the material that remains refreshingly modern and distinctly beautiful is the one that is the oldest of them all.

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1 The Washington Building, Seattle, Washington
Architects: Naramore, Bain, Brady, and Johanson, Seattle
General Contractor: Johnson-Morrison-Knudsen Co., Bellevue, Washington
Material: White Cherokee

2 National Bank of Detroit
Architect: Albert Kahn, Detroit, Michigan
General Contractor: Bryant and Detwiler, Detroit, Michigan
Material: White Georgia

3 First National Bank of Decatur, Alabama
Architect: H. Lloyd Hill, Atlanta, Georgia
General Contractor: Pearce & Gresham, Decatur, Alabama
Material: Rockwood Imperial Veined Alabama Limestone

4 The First National Bank of Atlanta, North Avenue Branch, Atlanta, Georgia
Architect: Francis P. Smith & Henry H. Smith, Atlanta, Georgia
General Contractor: Daniel Construction Co. of Georgia, Atlanta, Georgia
Material: White Cherokee

5 First Federal Savings & Loan Association, Augusta, Georgia
Architect: Kuhlke & Wade, Augusta, Georgia
General Contractor: Clarence Mobley Contracting Co., Augusta, Georgia
Material: White Georgia

6 Fulton Federal Savings & Loan Association, Buckhead Branch, Atlanta, Georgia
Architect: Thompson, Hancock & Hackworth, Atlanta, Georgia
General Contractor: Jiroud Jones & Company, Atlanta, Georgia
Material: White Cherokee Split Face, 4½" rise

For details of home installations, see Sweet's Light Construction File, 11c/Be.

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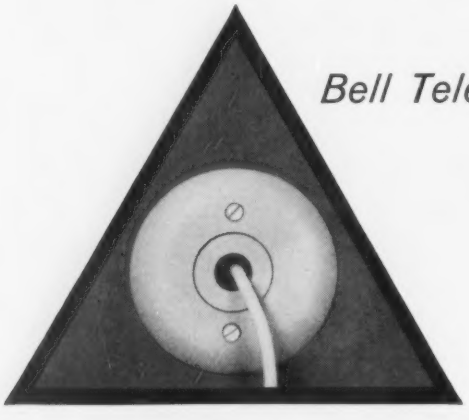

Bell Telephone System

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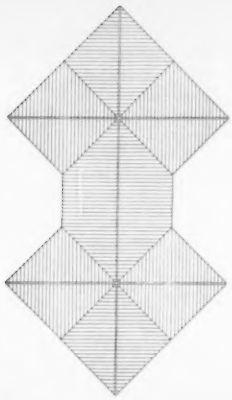

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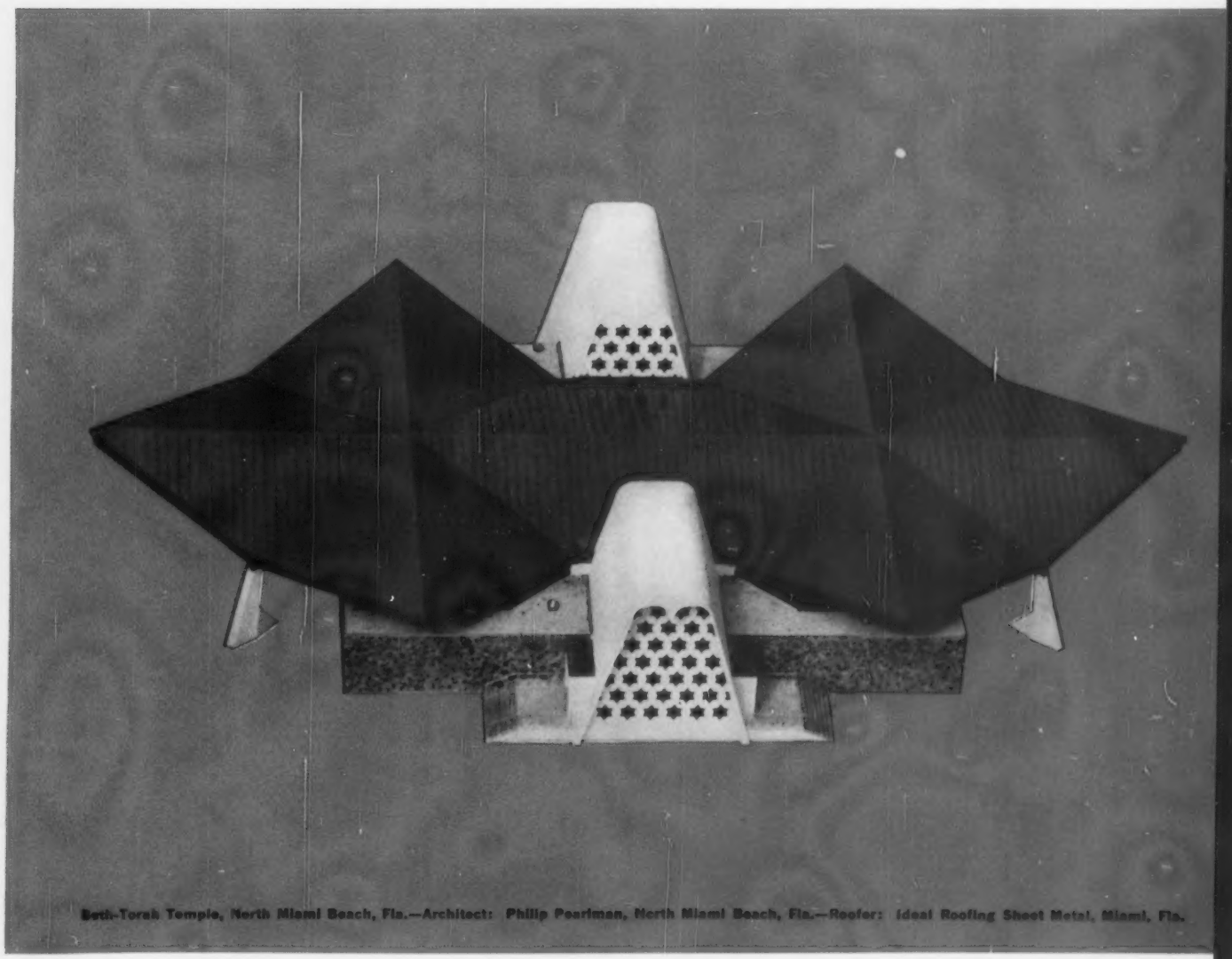

Beth-Torah Temple, North Miami Beach, Fla.—Architect: Philip Pearlman, North Miami Beach, Fla.—Roofer: Ideal Roofing Sheet Metal, Miami, Fla.

FOLLANSBEE STEEL CORPORATION
Follansbee, West Virginia

Follansbee is the world's pioneer producer of seamless terne roofing

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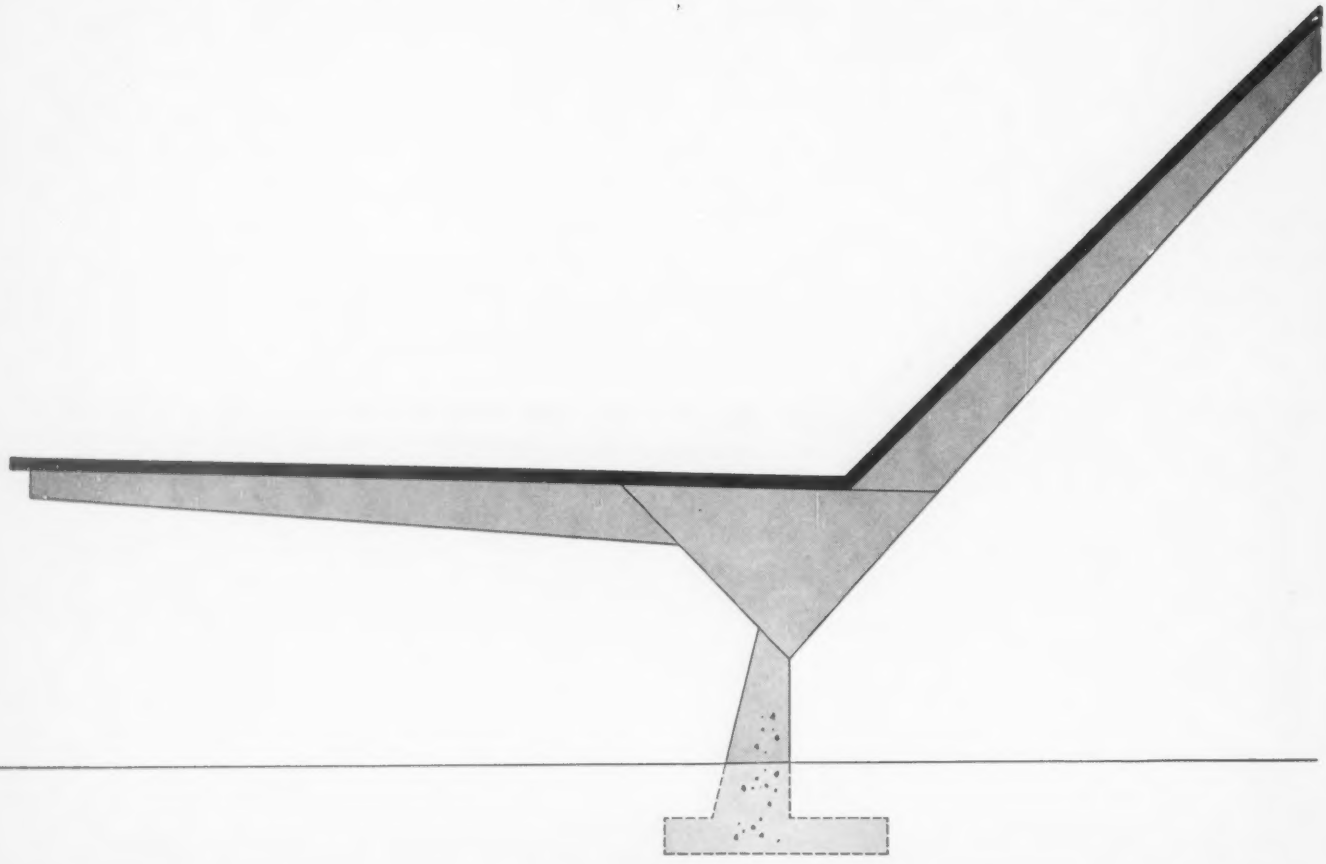

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PARK LODGE ELEMENTARY SCHOOL
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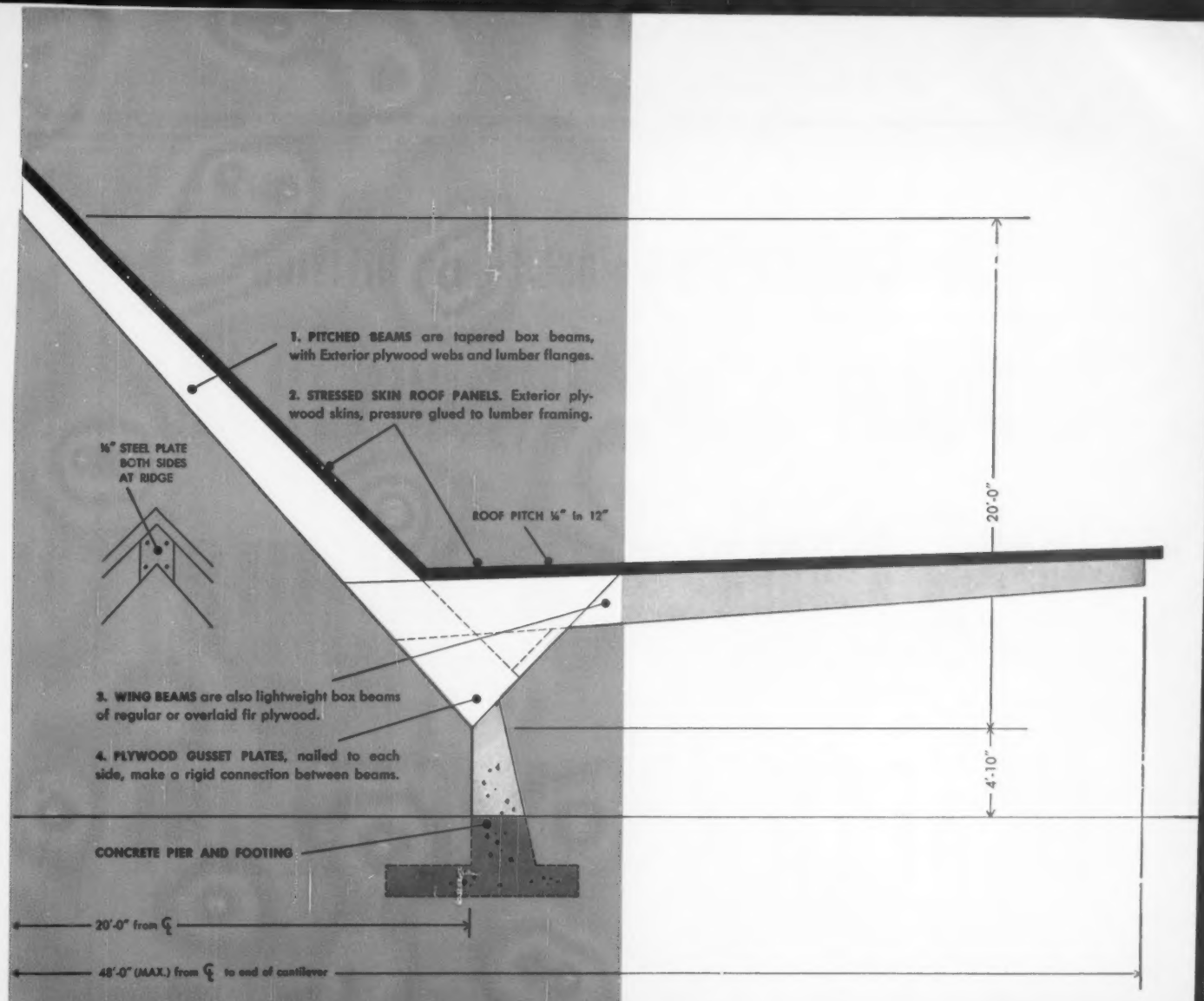
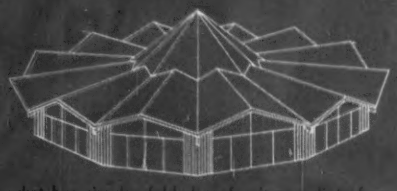
ARCHITECT: Robert Bruce Waring, Tacoma
CONTRACTOR: Korsmo Brothers, Tacoma


1. PITCHED BEAMS are tapered box beams, with Exterior plywood webs and lumber flanges.
2. STRESSED SKIN ROOF PANELS. Exterior plywood skins, pressure glued to lumber framing.
¼" STEEL PLATE BOTH SIDES AT RIDGE
ROOF PITCH ¼" in 12"
20'-0"
3. WING BEAMS are also lightweight box beams of regular or overlaid fir plywood.
4. PLYWOOD GUSSET PLATES, nailed to each side, make a rigid connection between beams.
4'-10"
CONCRETE PIER AND FOOTING
20'-0" from ℄
48'-0" (MAX.) from ℄ to end of cantilever

THE DELTA SYSTEM PERMITS LIMITLESS DESIGN VARIATIONS



Supermarket has circular folded roof; wings radiate from center.

School is a series of Delta units with cantilevered wings joined.

Pool, under Delta section, is flanked by plywood vaulted cabanas.

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For more information on Delta System and other plywood components, and name of fabricator nearest you, write Plywood Fabricator Service, Inc., Chicago 17, Ill. Delta components are made and sold only by PFS licensees, and are available in most parts of the country. For basic plywood design data, write (USA only) Douglas Fir Plywood Association, Tacoma 2, Washington.

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THE JURY READING FROM LEFT TO RIGHT:
E. Todd Wheeler, FAIA, Chairman, AIA Committee on Hospitals and Health • James J. Souder, AIA • Donald E. Neptune, AIA • Raymond Brown, School of Hospital Administration, University of Chicago • Donald S. Nelson, FAIA • A. Gordon Lorimer, FAIA, Professional Advisor.

NATIONAL AWARDS

Grand Prize . . $10,000

Victor A. Cusack, AIA, and Ronald Meza — Charles J. Luckman Associates, Beverly Hills, Calif.

James S. Moore, AIA — Medical Planning Associates, Beverly Hills, Calif.

Second Prize . . $5,000

Jimmie W. Bruza, James F. Knight — Oklahoma State University, Stillwater, Okla.

James S. Daley and William C. Watson, Jr. — Oklahoma State University, Stillwater, Okla.

Third Prize . . . $2,500

John V. Shoeris, AIA — Harley, Ellington, Cowin & Stirton, Inc., Detroit, Mich.

William J. Johnson, ASLA, and Clarence Roy, ASLA — Johnson/Roy, Ann Arbor, Mich.

$500 Merit Awards

1. Miller Edward Gerardy and Richard W. Cramer — Oklahoma State University, Stillwater, Okla.
2. Masao J. Itabashi and Harutun Vaporciyan — Smith, Hinchman & Grylls Assoc., Inc., Detroit, Mich.
3. Alan Bentley Glass, Forrest L. Johns and David M. Griffin — Oklahoma State Univ., Stillwater, Okla.
4. Pacifico Bacalzo and Borivoj Rieb — A. Epstein & Sons, Inc., Chicago, Ill.
5. Marvin Berman, AIA, and Stanley S. Kogan, AIA — Berman & Kogan, Los Angeles, Calif.
6. Ted Granzow, Robert D. Guss, Jr., Dellas H. Harder — Skidmore, Owings, & Merrill, New York, New York; Edward Durell Stone, New York, New York; Ohio State University, Columbus, Ohio

CITATIONS

1. Stanley E. Abercrombie, Jr. and John M. Ellis — Massachusetts Institute of Technology, Cambridge, Mass.
2. Firoz Rustum Mistry — Lester C. Haas, AIA, Shreveport, La.
3. David Leash — Merrill Jew, San Francisco, Calif.
4. Earl Matthews Farnham — University of Illinois, Urbana, Ill.

SPECIAL STUDENT AWARDS

First Prize $2,000

Alan Bentley Glass, Forrest L. Johns and David M. Griffin — Oklahoma State University, Stillwater, Okla.

Second Prize . . $1,000

Miller Edward Gerardy and Richard W. Cramer — Oklahoma State University, Stillwater, Okla.

Third Prize $500

Don Dommer and Gordon Kovell — North Dakota State University, West Fargo, N. D.

$250 Merit Awards

1. Stanley E. Abercrombie, Jr. and John M. Ellis — Massachusetts Institute of Technology, Cambridge, Mass.
2. Blythe S. Brewster — Pratt Institute, Brooklyn, N. Y.
3. John L. Lawler — University of Minnesota, St. Paul, Minn.
4. William E. Pedersen, Jr. — University of Minnesota, St. Paul, Minn.

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3rd Annual
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Architect — Schuman & Lichtenstein
Structural Engineer — Charles Mayer

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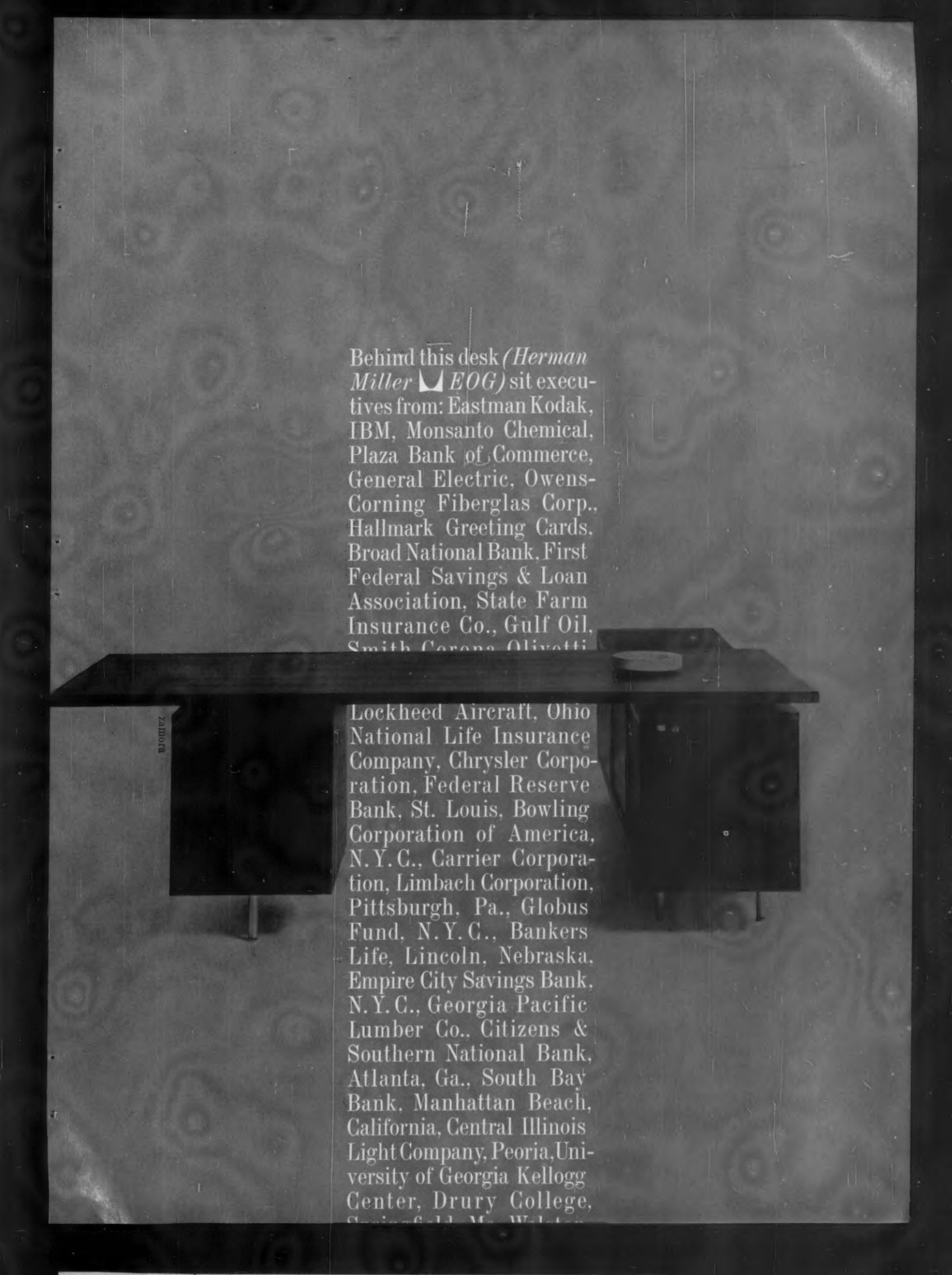
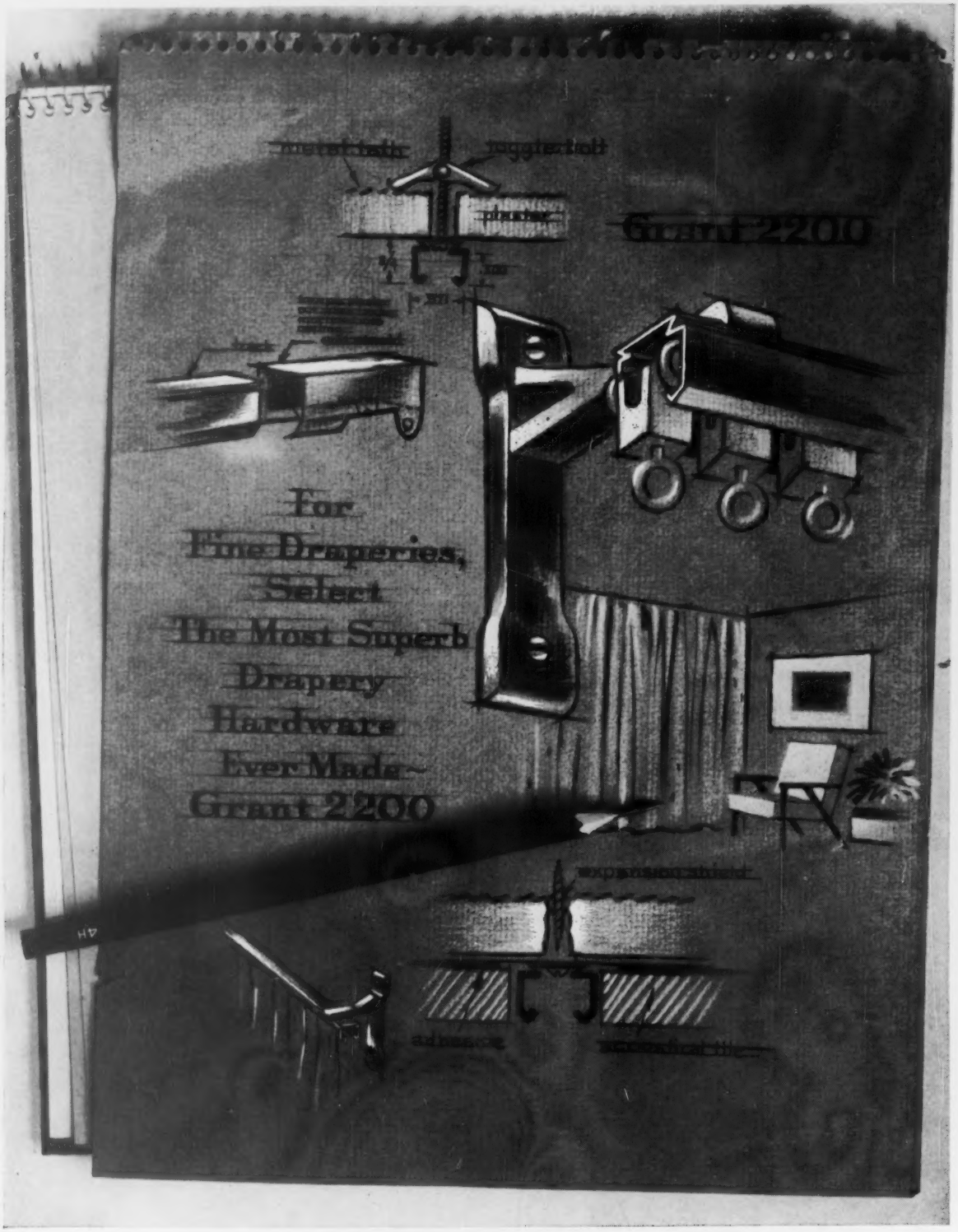


Behind this desk *(Herman Miller ⌣ EOG)* sit executives from: Eastman Kodak, IBM, Monsanto Chemical, Plaza Bank of Commerce, General Electric, Owens-Corning Fiberglas Corp., Hallmark Greeting Cards, Broad National Bank, First Federal Savings & Loan Association, State Farm Insurance Co., Gulf Oil, Smith Corona Olivetti Lockheed Aircraft, Ohio National Life Insurance Company, Chrysler Corporation, Federal Reserve Bank, St. Louis, Bowling Corporation of America, N.Y.C., Carrier Corporation, Limbach Corporation, Pittsburgh, Pa., Globus Fund, N.Y.C., Bankers Life, Lincoln, Nebraska, Empire City Savings Bank, N.Y.C., Georgia Pacific Lumber Co., Citizens & Southern National Bank, Atlanta, Ga., South Bay Bank, Manhattan Beach, California, Central Illinois Light Company, Peoria, University of Georgia Kellogg Center, Drury College, Springfield, Mo. Webster



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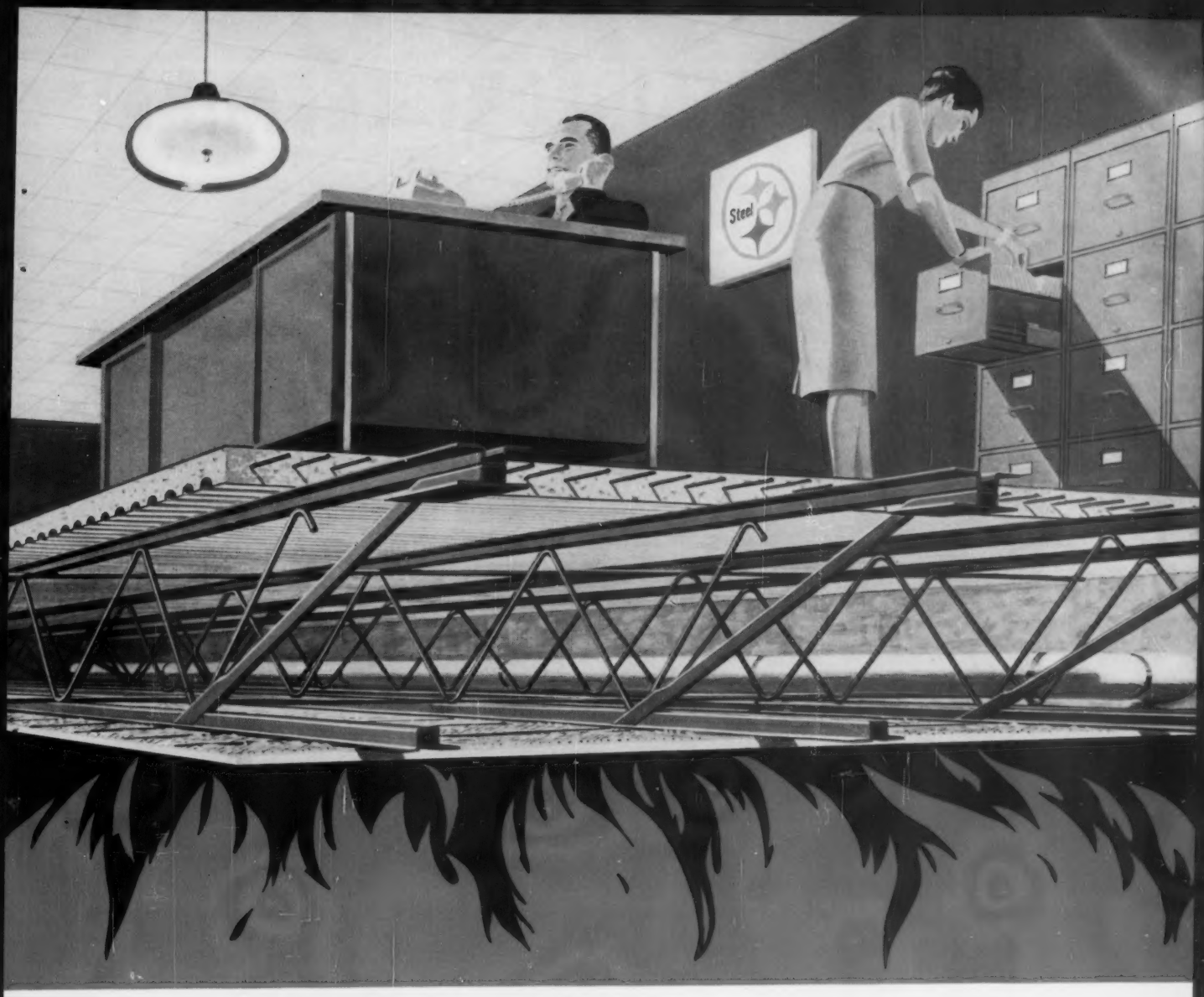

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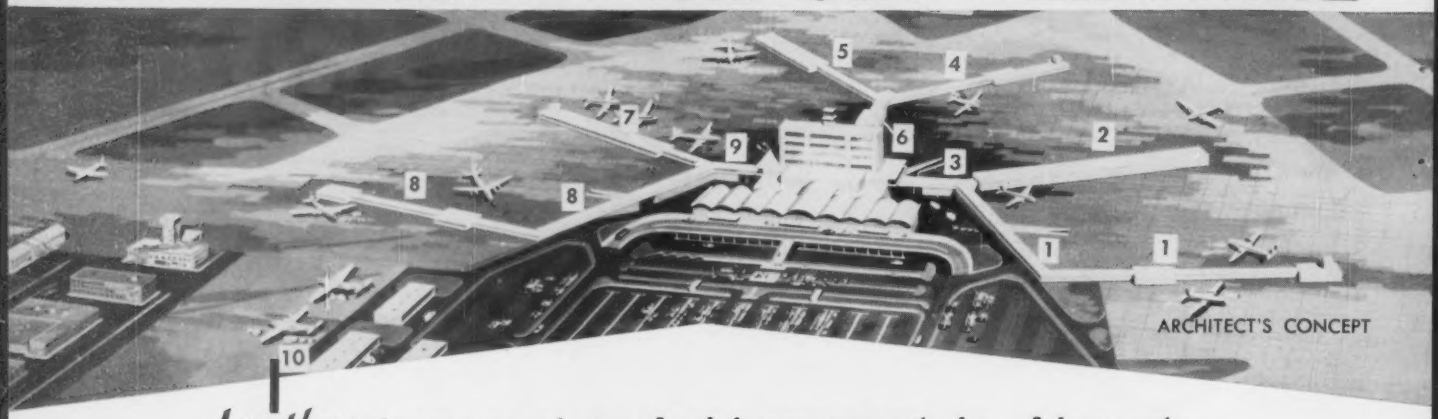

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General Contractor:
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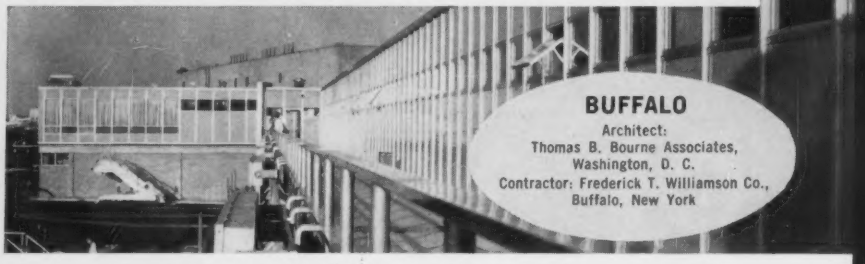
Montgomery, Alabama



BUFFALO
Architect:
Thomas B. Bourne Associates,
Washington, D. C.
Contractor: Frederick T. Williamson Co.,
Buffalo, New York

NEWARK
Architect: A. Gordon Lorimer,
New York City
Structural Engineers: Strobel & Rongved,
New York City
Contractor: Carl Buhr, Inc.,
New York City

CLEVELAND
Architects:
Outcalt, Guenther and Van Buren,
Cleveland, Ohio
General Contractors: The R. S. Ursprung Co.,
Cleveland, Ohio

PITTSBURGH
Designers:
Joseph Hoover and Dept. of Aviation,
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General Contractor:
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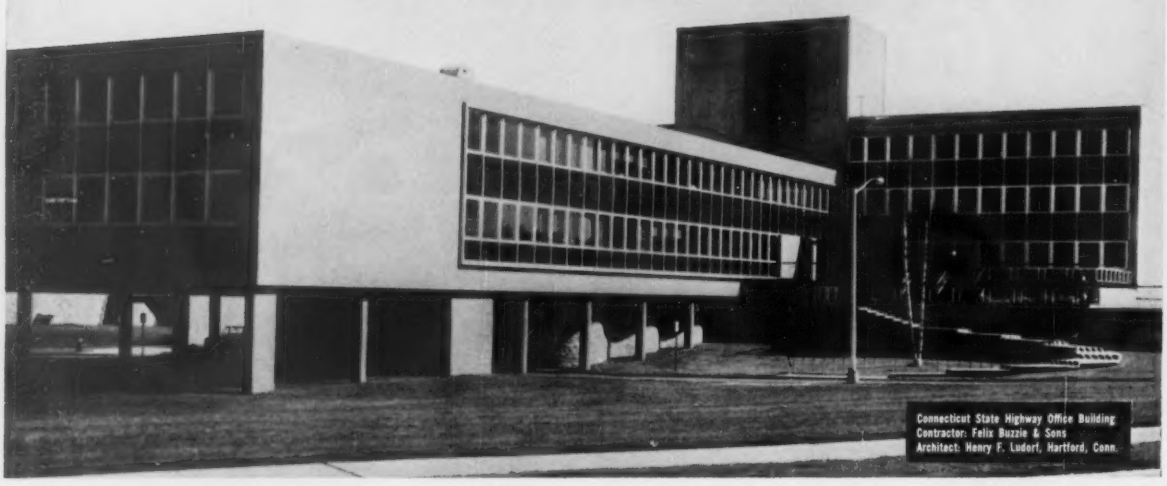
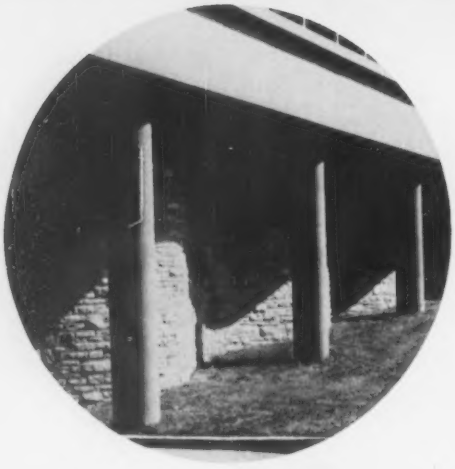


Connecticut State Highway Office Building
Contractor: Felix Buzzie & Sons
Architect: Henry F. Ludorf, Hartford, Conn.



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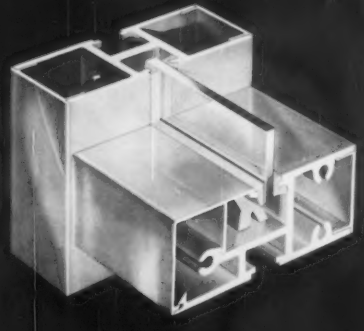

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PPG SOLARGRAY® Plate Glass pays big dividends *in new Harris Bank Building*

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Contractor: Turner Construction Co.
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Architects & Engineers: Frank Grad & Sons, Newark, New Jersey. **Contractor:** Massett Building Company, Atlantic City, New Jersey

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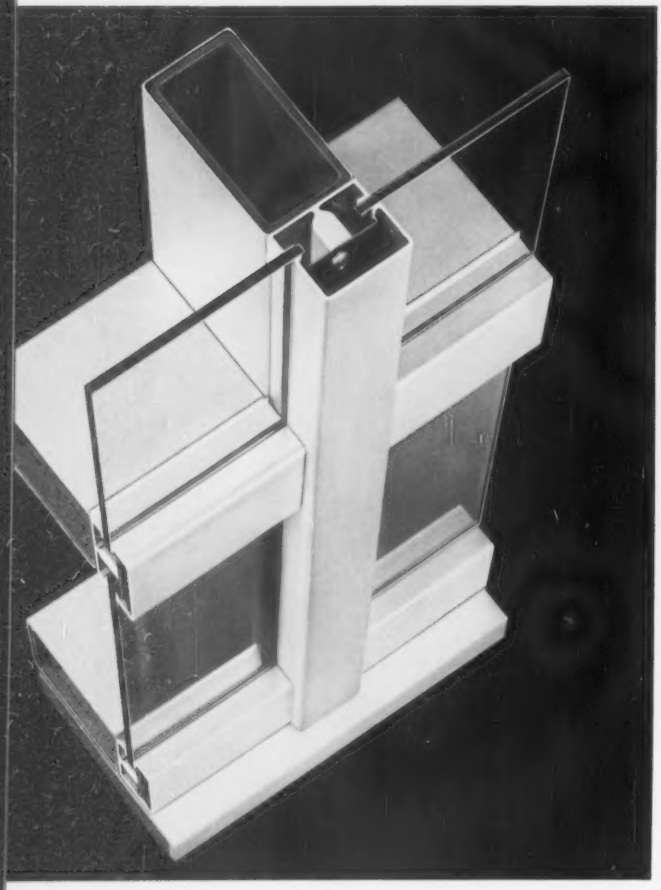

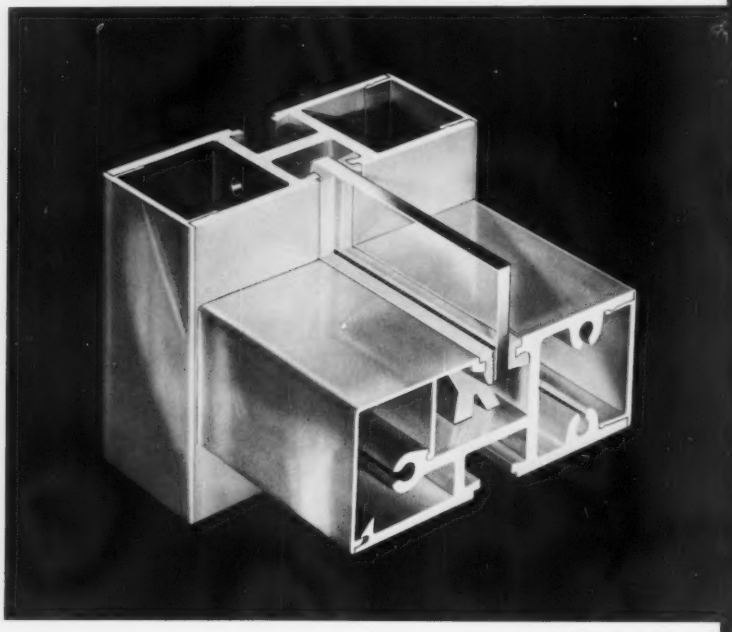

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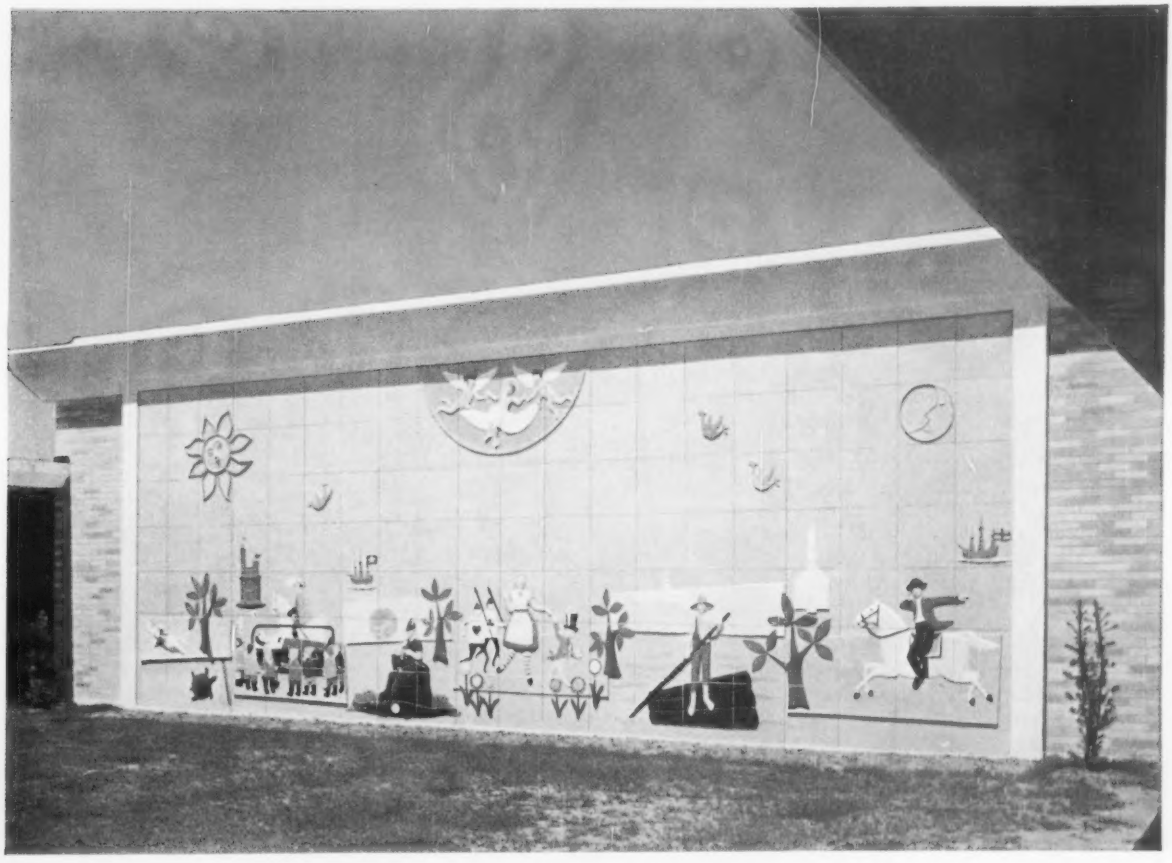

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February 20, 1961

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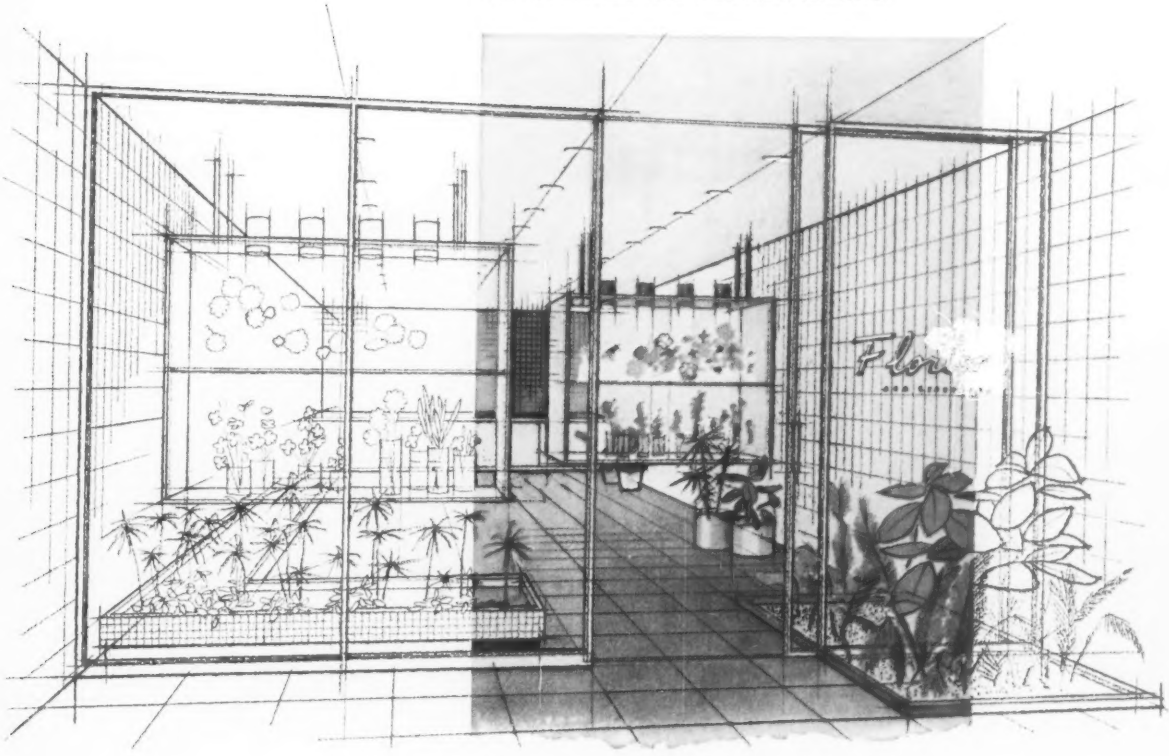

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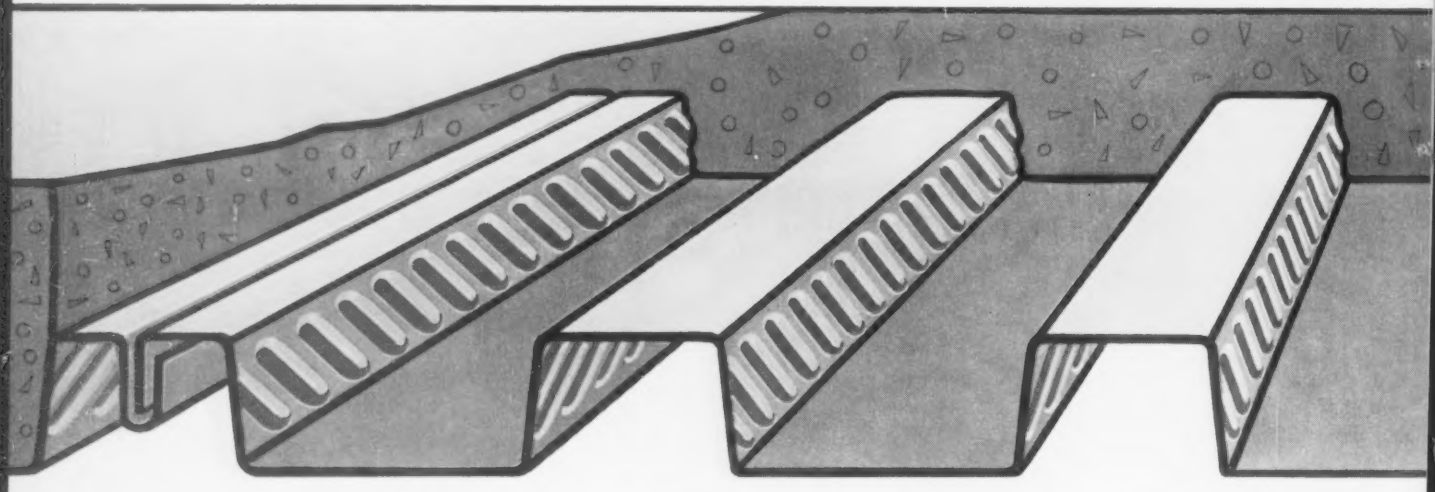

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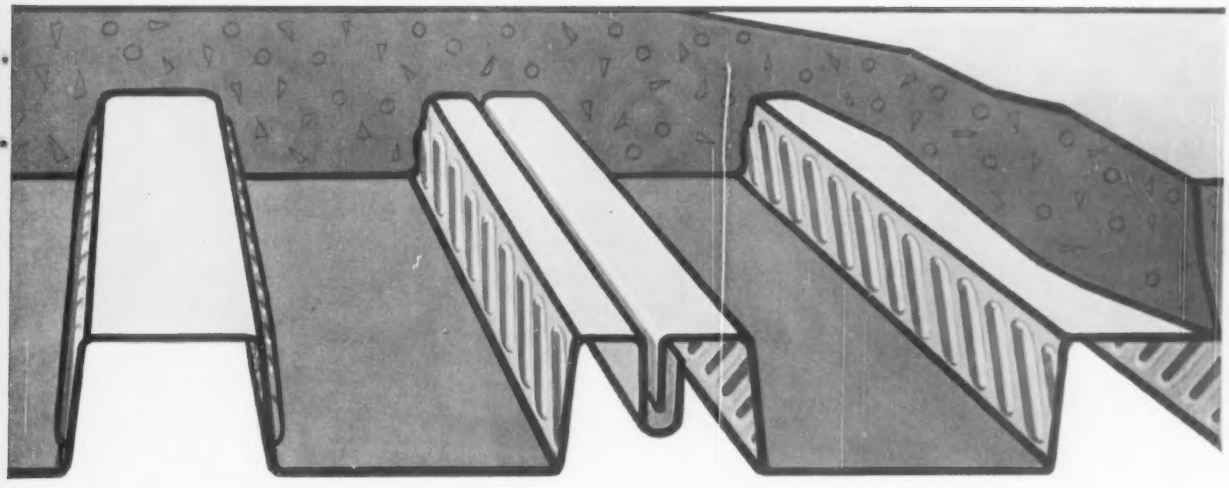

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"The Gizmo", Students' Snack Room, Knox College. Architects: Perkins & Will. Plate 451.

What to use for a "Gizmo" Floor?

Murray Quarry Tile was selected for this student eating area because of its warm earthy colors and its well-known durability. These new Ember Flash tiles give a pleasing mottled effect, and the 8″x3⅞″ size was used to achieve a subdued feeling of pattern. Quarry tile was preferred, too, in this heavy traffic area, because it is rugged, yet so easy to keep clean. Write for Murray Quarry Tile catalog 861.

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PROGRESSIVE ARCHITECTURE SEPTEMBER 1961

NEWS REPORT

Architecture's Monthly News Digest of Buildings and Projects, Personalities, New Products

Berenice Abbott photo courtesy Museum of the City of New York

Take what may be a last look at the majestic space of Penn Station's arrivals room; it may be replaced by a sports center.

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66 HARVARD-MIT JOINT URBAN CONFERENCE
67 WINNING DESIGN FOR TRINITY COLLEGE
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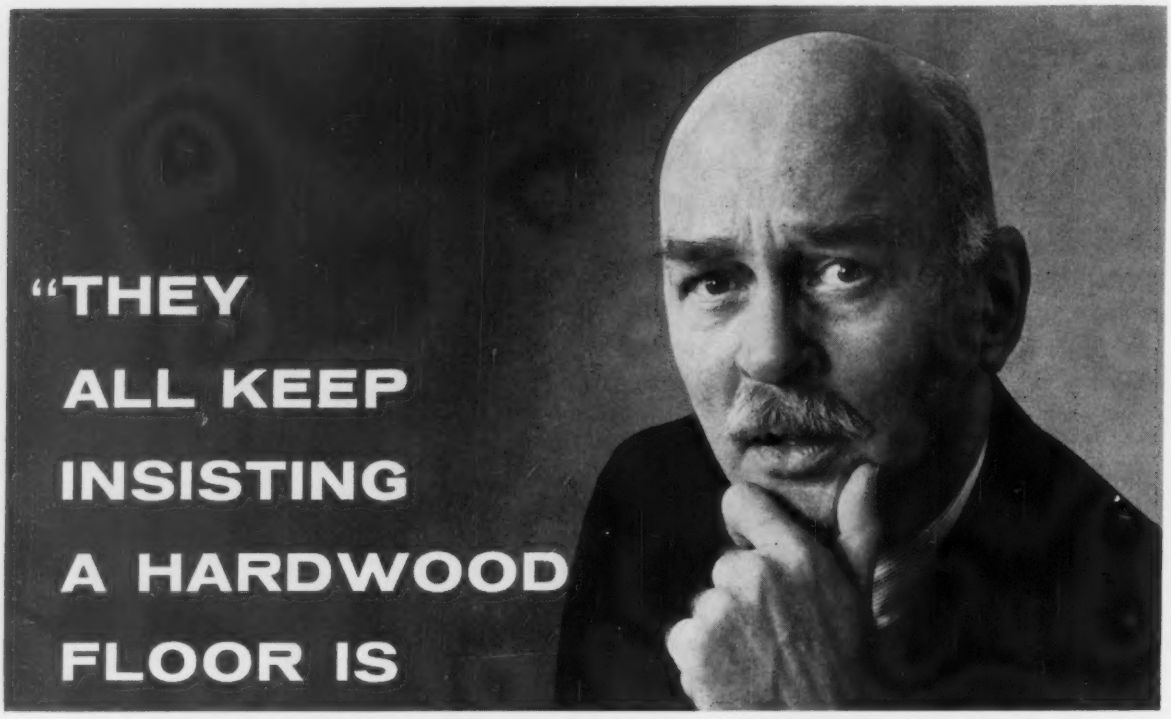

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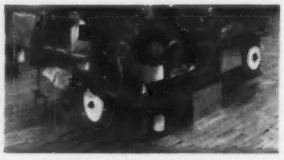

New P. Lorillard floor installed by R. L. Dresser, Raleigh, N. C. Architect-Engineer, Lockwood-Greene Co., New York

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Penn Station To Give Way To Madison Square Garden

Great Spaces in Peril; RR To Go Underground

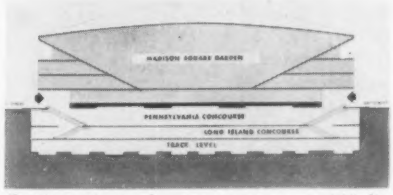
NEW YORK, N.Y. Madison Square Garden is really Stanford White's *bête noire*. First, Harry K. Thaw shot the poor man dead in the Garden's rooftop café, and now they are planning to tear down Pennsylvania Station (McKim, Mead & White, 1906) to put up the latest version of the *sportspalast* (Charles Luckman Associates, 1964?).

When P/A reported on the plans to build a new Madison Square Garden (p. 56, DECEMBER 1960 P/A), indications were that the project would be on the upper West Side, where it probably would have been an ornament. But Graham-Paige, owner of Madison Square Garden, and the fiscally undernourished Pennsylvania Railroad got together to arrange a long-term lease with renewal options totaling 99 years for the station site. Thus it is probable that the 55-year-old terminal building, characterized by Aline B. Saarinen as "one of the few remaining monuments" of the Eclectic Period, will vanish under the juggernaut of "Progress."

Elements to be included in the $75-million "Madison Square Garden Sports and Entertainment Center" are the 25,000-seat Garden itself, a 4000-seat auxiliary arena with rooftop ice rink, a 28-story, 750-room hotel, a 34-story commercial building, and "peripheral shopping areas." In an ebullient, if not modest, mood at the annunciatory press conference, Architect Luckman stated that "Architecturally, the new center wil offer a strong and dynamic design. . . . It will be a focus of interest and activity within New York comparable to Rockefeller Center, Lincoln Center, the United Nations grouping, and the proposed World Trade Center." (He did not say whether he was referring to those centers separately or together.) So far, The Municipal Art Society and the National Trust for Historic Preservation, plus a number of architects, have not shared Luckman's enthusiasm for the razing of Penn Station. The executive director of the National Trust, in a letter to appear in P/A's VIEWS column next month, stated that the proposed demolition "is of serious concern". New York has already been extremely reckless with its architectural monuments and can ill afford to sacrifice another," he wrote. Architect Harmon Goldstone, president of The Municipal Art Society, questioned whether the City Planning Commission could not decide on a suitable site for the new Garden and whether, if the project *is* to go ahead, the design cannot try to capture some of the grandeur the old station possesses. Reactions to the imbroglio by architects begin on page 78.

World War II view of station interior gives feeling of great space.

Proposed Pennsylvania concourse differs radically, to say the least.



Section shows how concourses would lie beneath Madison Square Garden.

Rendering of proposed Madison Square Garden complex. Two arenas, hotel, office building, and ice rink would replace station.

AN AGENCY PROMOTING URBAN STUDY

By Albert Bush-Brown

Since January 1959, the city as a social institution has received unprecendented attention at the ambitious Joint Center for Urban Studies in Cambridge, Massachusetts. The Joint Center is an experimental agency, administered co-operatively by Harvard University and the Massachusetts Institute of Technology, sponsored mainly by a grant from the Ford Foundation, and intended to stimulate research on the city and the region.

It has been a good parent. The two-year record, summarized in a recent report, shows that the Joint Center has stimulated and sponsored impressive studies in four areas:

1. In the analysis of the "Organization and Growth of Cities"—such as Edward C. Banfield's work on political patterns and their urban consequences; Bernard Frieden's investigations of renewal in gray areas; Charles M. Haar's comparisons of British and American zoning laws; Sam Warner's analysis of Boston's suburbs; and Lloyd Rodwin's study of Boston housing problems in *Housing and Economic Progress.*

2. In the area of "Urban Transportation and Technology," where, for example, Robert C. Wood, who gave New York a penetrating look in his just-published *1400 Governments*, is now evaluating problems metropolitan communities face in adjusting manpower to deal with the technical innovations that are changing urban life.

3. In "Urban Design," the Joint Center currently sponsors four projects, including Serge Chermayeff's program for high-density communities composed of individual urban houses, and Kevin Lynch's continuing insights into the visual metropolis, announced in his *The Image of the City* (reviewed on page 226) and made more suggestive for designers in his article, "The Pattern of Metropolis" (*Daedalus*, Winter 1961).

4. In the area of "Urban Problems in Developing Countries," where the Joint Center is now helping to fashion the economic and physical plan for a new industrial city in the Orinoco-Caroni area of southeastern Venezuela.

Equally important, the Joint Center has encouraged the interchange of ideas about urban problems by holding frequent meetings and seminars, which aim at interesting people in overcoming our national neglect of basic research on the city and the region.

The most recent of the Joint Center's conferences was held the week of July 24 at Harvard's Summer School. It brought together 62 scholars from more than 20 universities. Although they represented many disciplines (from social cybernetics and economics to history and philosophy), the scholars' lectures and discussions (to be published) had a single theme: the City and History. That topic was selected to encourage scholars to focus attention upon the city as a central subject for research, thus perhaps encouraging universities to establish interdisciplinary departments of urban study.

Harvard's Oscar Handlin, opening the conference, stressed the need for detailed, historical studies of particular cities so that we may learn how urban developments unfold the contest between human will and nature. Our lack of scholarly studies about the history of our cities prevents our gaining insight into the processes of their urban formation, disintegration, or renewal. We remain bound to gross generalizations about events, their causes and effects; we are not able to understand, much less predict, why a Philadelphia can embark on a renewal program while a Boston does not; why, over-all, there has been a decline in urban creativity, strikingly revealed in the regression to private forms of transportation.

The conference might have bored the practical and impatient, for it was verbal not visual, historical not futuristic, vague not programmatic. Still, a series of well-written, imaginative papers drew exciting pictures of cities we know, and revealed also, by their omissions and uncertainties, our ignorance of urban processes.

No one was ready to handle the topic of the first day, "The Role of the City in Technological Innovation and Economic Development." Yale's Robert Lopez *did* suggest some useful distinctions between four types of city ("stockade," "agrarian," "market," and "industrial"), and he keenly depicted the contradictory personality of mercantile Genoa in 1300. But neither Lopez nor Shigeto Tsuro, the Japanese who followed him, came to terms with the technology of power and resources as it affects urban life. Painfully, it soon became apparent that the conference reflected our preference for the verbal over the visual, the humanistic and sociological over the scientific and technological.

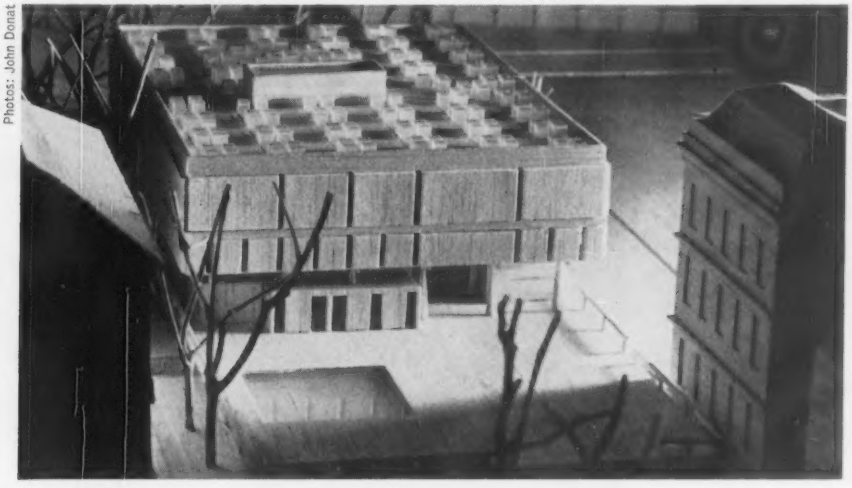
The second session, "The City in the History of Ideas," produced an interesting paper by Harvard philosopher Morton G. White. His thesis—that America's writers from Thomas Jefferson to Henry James and John Dewey have consistently deprecated the city—explains why universities, in particular, have been slow in studying this social institution. White's explanation of antiurbanism (love of agrarian serenity and romanticism in the pre-Civil War period and distaste for urban vulgarity thereafter) seemed to neglect the attitude announced by Henry Adams, for example, that cities, which could be beneficent, had been corrupted so that neither he nor his friends could gain the means of guiding them. Indeed, that frustration was a chief message in Berkeley historian Carl Schorske's brilliant paper about European urban attitudes. The conference's purpose was illustrated when he deftly traced the passage from the Enlightenment idea of the city as Virtue, to the Industrial idea of the city as Vice, and the arrival at a state of inaction, the mid-19th-Century fatalism, the city as a necessity neither good nor evil.

"The City as Artifact" provoked the wit of Sir John Summerson, who asked two questions: What is good urban history (he cited Rasmussen's *London, The Unique City* as an example), and why does a beautifully planned neighborhood, Covent Garden, decline, while a nondescript, commercial development, Chalcots, sustains London society, even elevates itself as time passes? The latter question was not answered by Sir John, and the former was not fulfilled by his co-speaker, the University of Pennsylvania's Anthony Garvan, in spite of his informative account of planning in colonial Philadelphia.

The final session, intended to draw implications from history for the contemporary urban world, was more soul-searching. Kenneth E. Boulding, an economist at the University of Michigan, took a frightened look at our passing from civilization to "post-civilization." We no longer need the classical city, he argued, with its concentrations (sitting ducks for H-bombs) or its antique forms of transport and communication. He visualizes an even sprawl of self-sufficient households run with solar-powered electronics. Nor was Denis Brogan, of Cambridge University, more optimistic that we shall escape the self-strangulation of the city (though he does not share Boulding's prospect).

The conference hit few targets well, but its chief purposes—to open communication among diverse scholars, to suggest the city as an object of research—were well served. This agency should receive further support, for, short of survival itself, the city it studies is our most vital problem.

Photos: John Donat



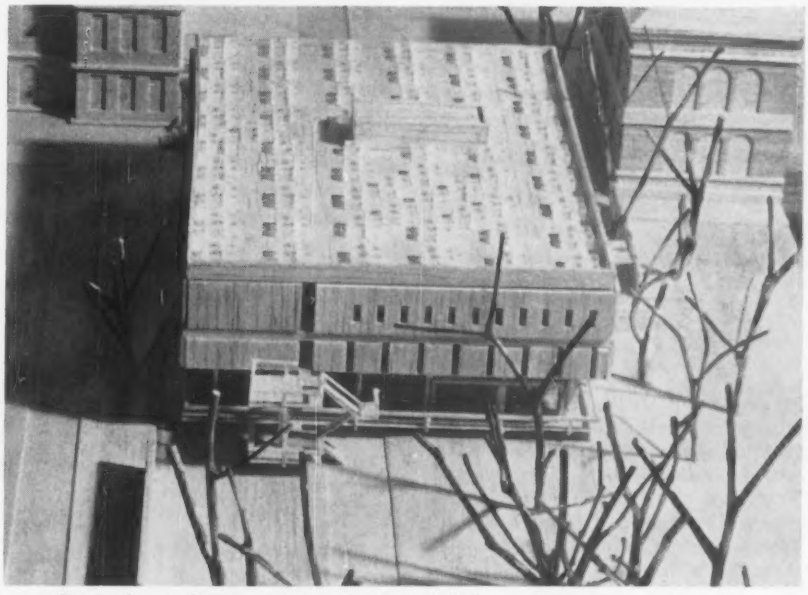
Thoughtful Design Wins Trinity College Competition

DUBLIN, IRELAND. From a field of 218 entries from 29 countries, the winner of the competition for the design of the new library at Trinity College, University of Dublin, has been announced to be Paul G. Koralek of Great Britain. Koralek was working with Marcel Breuer in New York when he won the competition, has since set up a practice—Ahrends, Burton & Koralek—in London.

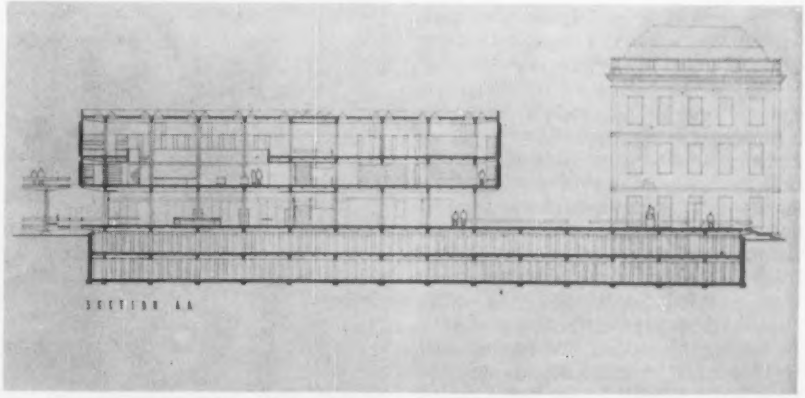
The winning design is a dignified rectangular structure which, while quite contemporary in feeling, will relate well to the adjacent 18th-Century library building. The jury felt that the "main cornice and string-course levels have been well preserved" and that the "façade exhibits a sensitive progression of windows which is carefully proportioned."

The Koralek proposal sites the library facing a handsome plaza between the old library and the college museum. Structural system is mainly precast concrete columns and trusses with *in situ* walls and floors. Upper external walls are granite-faced to match the existing buildings, with black limestone on the ground floor. The circulation and service core has an enclosing wall faced with dark-green marble.

The ground floor contains entrance hall, administrative offices, catalog, bibliography, and reference rooms, and an open reading terrace. First floor houses periodicals and general reading room, special subject reading alcoves, and part of the open stacks. Top floor has a small informal reading room, carrels, and the remainder of the open stacks. The general reading room is two floors high, culminating in an exposed, white-painted concrete, skylighted ceiling.



Rear view indicates relation to older buildings, shows reading terrace.



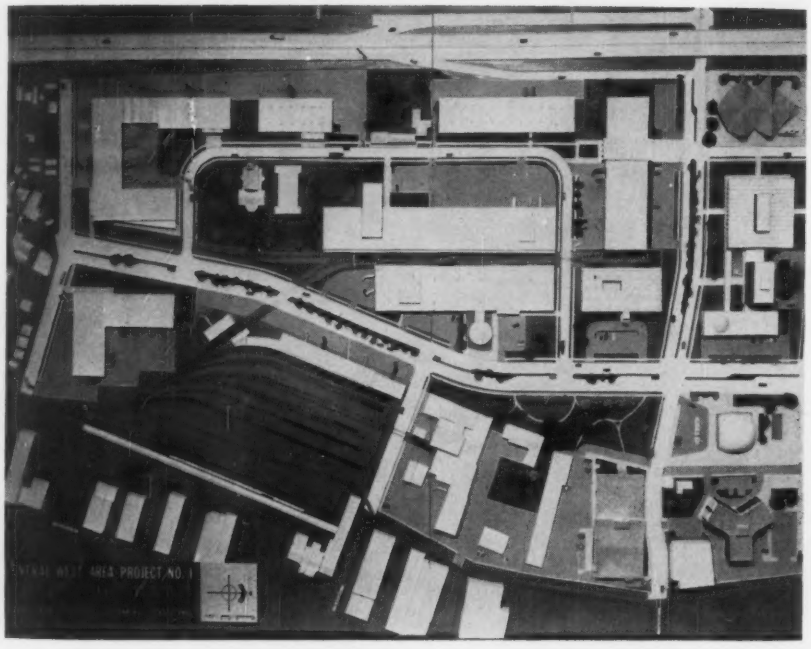
Two-story general reading room, entrance from court are seen in section.

First Major Urban Renewal for San Antonio

SAN ANTONIO, TEXAS Word from the top was received recently by the San Antonio Urban Renewal Agency when Vice-President Lyndon B. Johnson notified Executive Administrator M. Winston Martin that the Housing and Home Finance Agency had approved the city's loan and grant application for Texas's first total clearance-for-renewal project.

The area under consideration consists of 68 acres in the central business district, hard by the yards of the Missouri-Kansas-Texas Railroad. According to Martin, "97% of business and residential structures in the project area are substandard in building and environmental elements, [and] all 368 residential structures are deficient in one or more of the basic necessities."

As designed by Marmon & Mok of San Antonio, the area, known as Central West Area Project 1, will be devoted mainly to commercial and light industrial use. A downtown expressway and the adjacent railroad freight yards suit the site ideally for wholesale distribution centers. Elimination of less-traveled streets will create larger blocks.

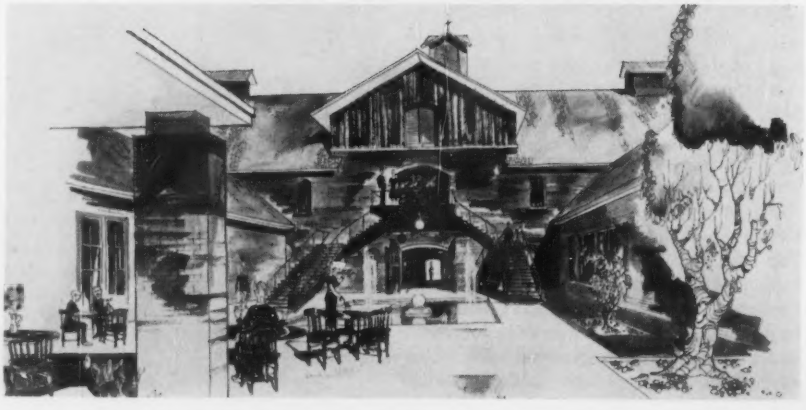


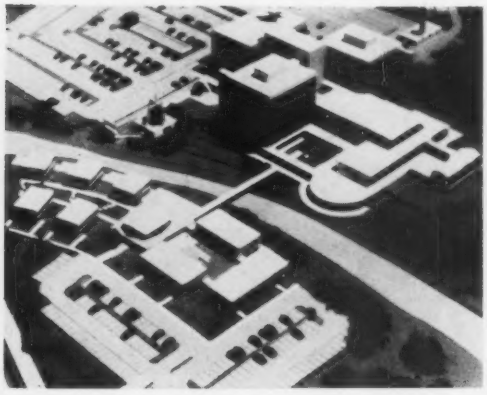
In addition to the industrial and commercial uses for the project, designs will be provided for a professional building, a juvenile court, a retail shopping area, and an "International Trade Center."

Metamorphosis: Winery Into Cultural Center

PALO ALTO, CALIF. An historic ex-winery, the only building in this area to withstand earthquakes since it was built in 1883, will be converted by San Francisco Architect John S. Bolles into a $2-million cultural and business center (*below, right*). The winery stands in a field on the Stanford University campus, and will be leased from the university for 35 years. Nearby is a large shopping center, also designed by Bolles.

The immense old brick structure will contain a bank, a stock brokerage office, a travel agency, a 700–800 seat restaurant featuring an international cuisine, and an art gallery, probably a branch of Bolles' own San Francisco gallery (he also is opening a new one in New York later this month). Evidently not too much violence will be done to the warm character of the existing building (*top, right*). Bolles intends to retain the original brick walls, gabled roofs, and the large cupola which highlights the roof line. A coating of stucco will be removed to reveal the original bricks, and the wine keg wall will be used as a major entrance to the restaurant.





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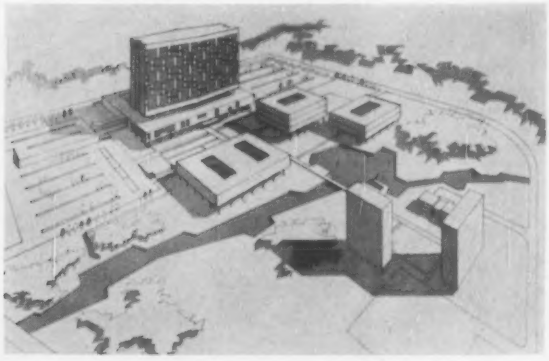

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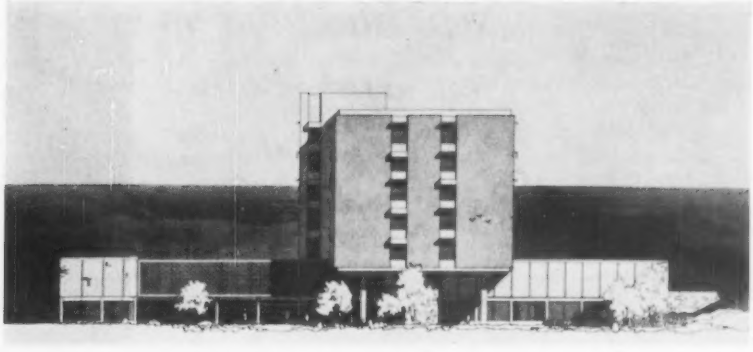

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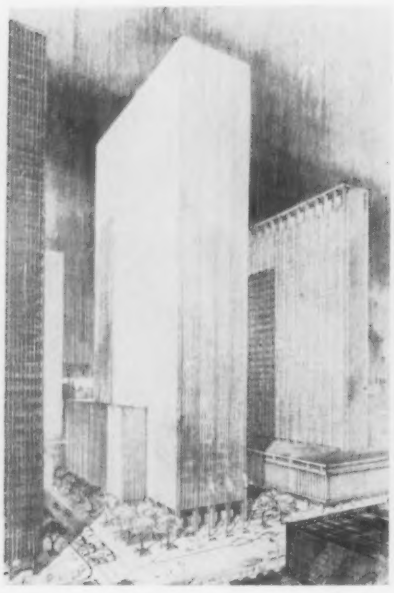
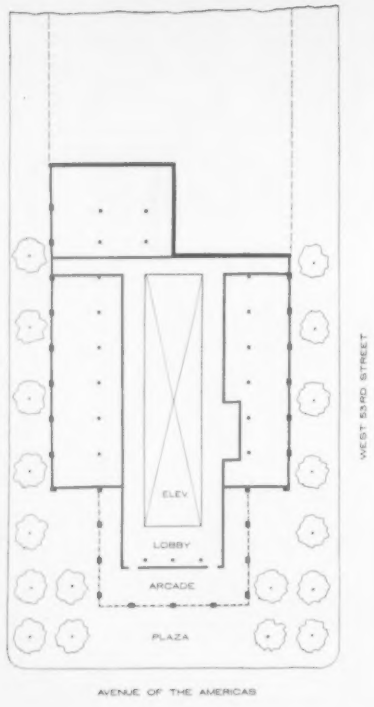
Winners of Mastic Tile's Medical Center Competition

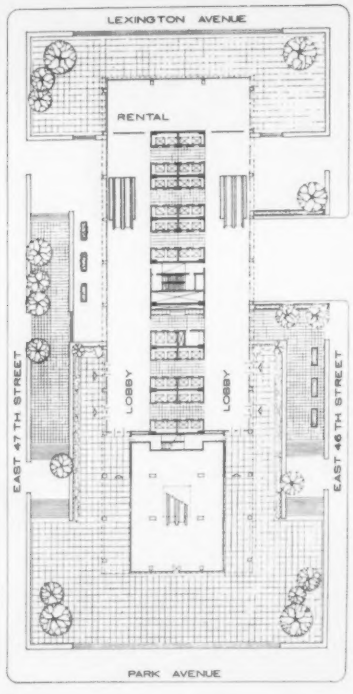
NEW YORK, N.Y. The surburban community which is gradually being designed in the annual competitions of the Mastic Tile Division of The Ruberoid Company received its medical center recently with the announcement of the winning designs for 1961. Judges for this year's program, which had as its theme "Long-Range Planning for the Medical Care Facilities in the Community," were Architects E. Todd Wheeler, Donald S. Nelson, Donald E. Neptune, and James J. Souder, and Ray E. Brown, Director of the University of Chicago Graduate Program in Hospital Administration. Architect A. Gordon Lorimer, as always, was professional advisor.

First-prize winners (**1**) are Victor A. Cusack and Ronald Meza of the office of Charles Luckman Associates, Los Angeles, and James S. Moore of Medical Planning Associates, Beverly Hills. Second prize (**2**) went to Jimmie W. Bruza, Greeley, Colo., James F. Knight, Stillwater, Okla., James S. Daley, Lindsay, Okla., and William C. Watson, Jr., Oklahoma City, Okla. Third prize (**3**) was won by John V. Sheoris of Harley, Ellington, Cowin & Stirton, Inc., Detroit, and William J. Johnson and Clarence Roy of Johnson & Roy, Ann Arbor. The first prize in the student group (**4**) went to a team from Oklahoma State University consisting of Alan Bently Glass of Baltimore, Md., Forrest L. Johns of Tulsa, Okla., and David M. Griffin of Memphis, Tenn.





New Buildings in New York Follow New Codes

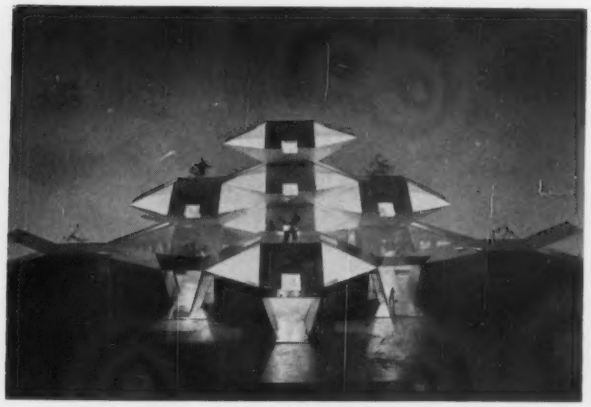


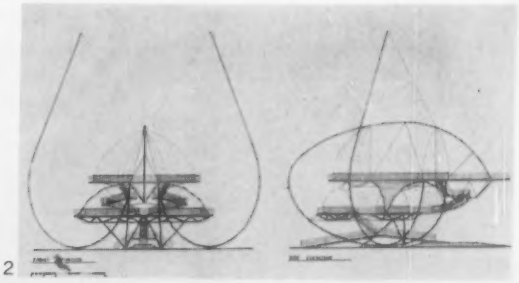
NEW YORK, N.Y. Three office buildings announced recently in New York show the effect that the city's new zoning law (the first since 1916) will have on tower design. The new code encourages the use of plazas, courtyards, and arcades by awarding bonuses (allowing more height for the building) when open space is provided for on the ground level. Thus New York's characteristic setback towers are being replaced by sheer towers which bring light and air down to the pedestrian's level.

The three proposed buildings (*left to right*) are: 1301 Avenue of the Americas by Shreve, Lamb & Harmon Associates; 140 Broadway by Skidmore, Owings & Merrill; and 245 Park Avenue by William Lescaze. The Avenue of the Americas building is in an area where a number of new buildings are rising, across from Rockefeller Center, but it is the first to give over such a large amount of area to open space at ground level. The 41-story tower has a landscaped plaza on the front and sides and an arcaded entrance lobby.

The 32-story SOM building, across the street from the Wall Street area's leading light, the Chase Manhattan Bank Building, follows its style. Two plazas now will break up and "aerate" the long canyon-like vistas of the financial district. The façade will have masonry sunshades projecting beyond the floor slab, a contrast to the larger building's metal-and-glass skin.

The design for 245 Park Avenue calls for a sheer metal-and-glass tower rising 55 stories, with a landscaped plaza on all four sides. The site is the block which slopes down from Park Avenue to Lexington between 46th and 47th Streets just north of the New York General Building (Grand Central Station).





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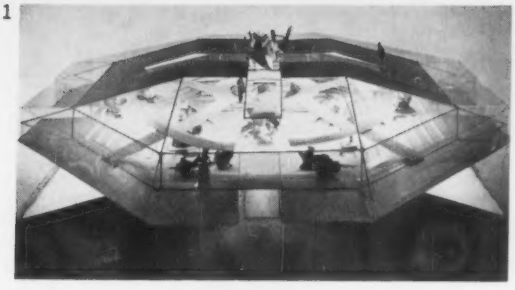


"VOLUMETRIC" DESIGNS SHOWN BY SCULPTOR

NEW YORK, N.Y. This month sees the opening of an exhibition of the works of sculptor Bernard Reder that will occupy the entire Whitney Museum. In addition to more than 70 sculptures and three dozen drawings and woodcuts, the show includes a number of architectural drawings and models based on Reder's "volumetric" concept of design.

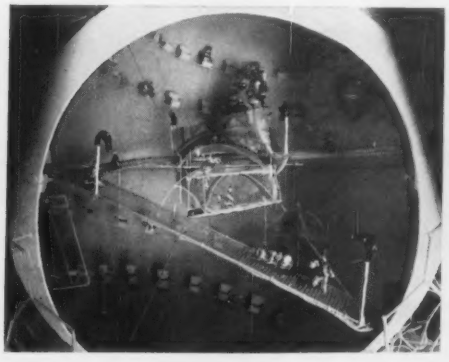
Reder conceives his approach as opposed to the "frontal spirit" of current architecture. He says this spirit uses the façade in a "Machiavellian" sense to "express the contrary of what is behind it, not letting the object speak honestly of its own value." Works of sculpture and objects in nature, he states, are all-sided, and all views or approaches should be of equal importance.

The volumetric idea is clearly seen in Reder's "Exhibition Building for Volumetric Sculpture with Volumetric Approach" **(1)**. This design is composed of a series of polyhedrons stacked and joined in honeycomb fashion. The viewer approaches the sculpture on sloping ramps and walks, steps, and extended platforms. Thus he will see the sculpture from above, below, and from all sides. The one-unit model is designed as the studio of a sculptor working in a volumetric manner.

A single-family pavilion **(2)** consists of a lightweight dwelling of synthetic materials suspended between two stabilizing arcs of stainless steel. The arcs are bolted to concrete piers and can be unbolted so that the 20,000-lb structure may be air-lifted from place to place.

Reder's theater in a sphere **(3)** is for presentation of performances to be seen from all sides. Spectators move slowly in a spiral along the innner surface of the 100-ft-diameter sphere while witnessing the performance in the center of the space. Scenery is of transparent materials so that only the actors are solid forms.

Feasibility studies of the designs have been made by Buckminster Fuller's Synergetics, Inc., Raleigh, N.C., which has found them to be not impossible of realization.



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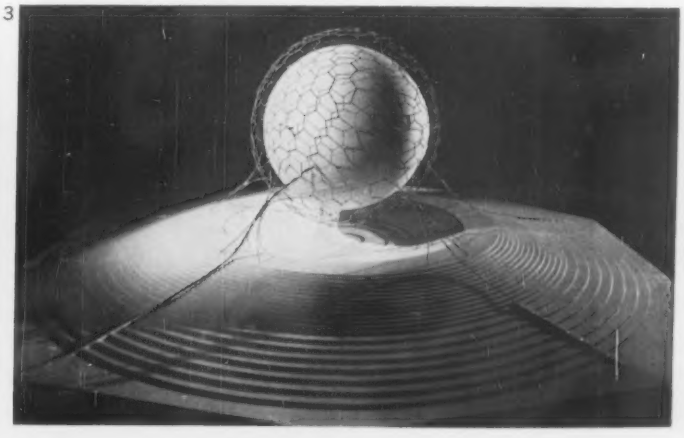

TWO STORIES OF INTERLOCKED STEEL frame the 320′ wide, 25′ high, middle section which houses two department stores. Standardized, interlocking girders and purlins required no bolting, riveting or field welding — reduced engineering, fabrication and construction costs — advanced completion and occupancy dates.

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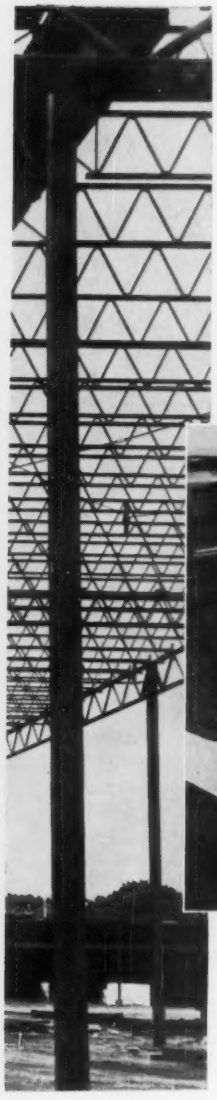

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PERSONALITIES

The short (so far), happy professional life certainly can be celebrated by **Samuel T. Hurst, Jr.** Made dean of

the School of Architecture and the Arts at Auburn University in Alabama in 1957, he will move up this month, at the age of 40, to become dean of the School of Architecture at the University of Southern California.

Hurst, whose distinguished summation at the 1959 AIA Convention in New Orleans will be remembered by many architects, received his B.Arch. from Georgia Tech in 1942, and his M.Arch from Harvard seven years later, World War II and a tour of Navy duty having intervened. Education has occupied most of his time since then, first as instructor at Georgia Tech, then as assistant professor at Tulane University, then back to Georgia Tech as associate professor and administrative assistant to the head of the School of Architecture. He also put in two years as head design associate in the office of Abreu & Robeson, Atlanta. Hurst was recently appointed to a four-year term on the National Architectural Accrediting Board.

Commenting on the new USC appointment, Dr. M.C. Huntley, Dean of Faculties at Auburn, said, "We congratulate him upon the promotion and recognition, and USC upon obtaining the services of such an excellent educator."

The chief raconteur of the stainless-steel door industry in New York is surely L. L. SCHACHT. "Lou" Schacht is known to architects and men throughout his industry as one who illustrates all observations with an appropriate anecdote, parable, or apothegm. Example: Talking of the rise in use of stainless steel for doors: "It's like when my son was a child. He was so young and I was so much older. Then he started catching up with me and now he's almost half my age. That's how stainless steel doors have caught up on their rivals." Example: Schacht's view of mutual congratulation and backslapping in related fields: "Two beggars, on meeting, complained bitterly over the lack of respect shown them by the general populace. 'I'll tell you what,' said one to the other finally, 'Let's make a pact. *I'll* call *you* Mister, and *you* call *me* Mister.'" Architecture and humor run in the Schacht family. Lou's son Carroll graduated in architecture from Yale and the University of London, practiced in Europe, has recently joined the business. Schacht *père's* brother Al is the noted baseball clown, with whom Lou owns the popular Al Schacht's Restaurant in New York.

The man from New Hope, Pennsylvania, has on his letterhead **George Nakashima, Woodworker.** He is a man

who got his B.Arch. at the University of Washington, M.Arch. at MIT, and the *diplome* of the Ecole Americaine des Beaux Arts in Fontainebleau, following which he worked with Antonin Raymond in Tokyo for a number of years. What changed him from architecture to "woodworking" (really the design of prized custom furniture)? Nakashima says, "My madness is somewhat influenced by a personal reaction to architectural practice in this country; novelty confused with originality or creativity, lack of fitness, intellectual sentimentality (to me we eliminated certain prejudices with the Bauhaus . . . and set up a completely new set of prejudices and dogmas). So we stay out of the currents of architecture and design and hack a physical surrounding out of 10 acres of wilderness and produce the best furniture we know how."

Whatever one's view of Nakashima's repudiation of architectural practice, it is certain that he did not arrive at his position lightly. During the hysteria against American nationals of Japanese origin in World War II, Nakashima was plucked out of the stream of things and interned at a concentration camp in Hunt, Idaho, for most of the war years. There, with no chance to practice and much time to think, he probably set his life's aim. Actually, he has designed and built since the war—for himself. The studio-work-building complex at New Hope consists of eight buildings, including three with conoid and two with hyperbolic paraboloid roofs. Nakashima describes what he is doing as "a way of life," integrating "design, work, manufacture, selling, landscape, recreation."

The new president of the southwest Washington chapter AIA is JOHN E. MCGUIRE of Tacoma . . . Honorary degrees have gone to HENRY L. LOGAN, Vice-President of Research, Holophane Co., Inc. (Doctor of Laws, Iona College, New Rochelle, N.Y.); PETER PAYSON, Assistant Director of Research, Crucible Steel Co. (Doctor of Engineering, Stephens Institute of Technology, Hoboken, N.J.); ERWIN S. WOLFSON, chairman of Diesel Construction Co. (Doctor of Laws, University of Cincinnati) . . . Pan Am Building builder WOLFSON also was elected president of the Academy of Religion and Mental Health (two commodities which will stand packed inhabitants of Pan Am purlieus in good stead) . . . DAVID A. WALLACE has been appointed professor of city planning in Graduate School of Fine Arts, University of Pennsylvania; he is director of Planning Council of Greater Baltimore Committee, Inc. . . . New president of National Society of Professional Engineers is MURRAY A. WILSON of Salina, Kans. . . . MINORU YAMASAKI received Honorary Degree of Doctor of Fine Arts from Rensselaer Polytechnic Institute . . . At its recent New York convention, Construction Specifications Institute named JAMES BORT of Chicago president . . . New York chapter AIA gave annual Medal of Honor to GORDON BUNSHAFT of SOM, Award of Merit to Othmar H. Ammann of Ammann & Whitney.

Sketches by Romano Corbellini

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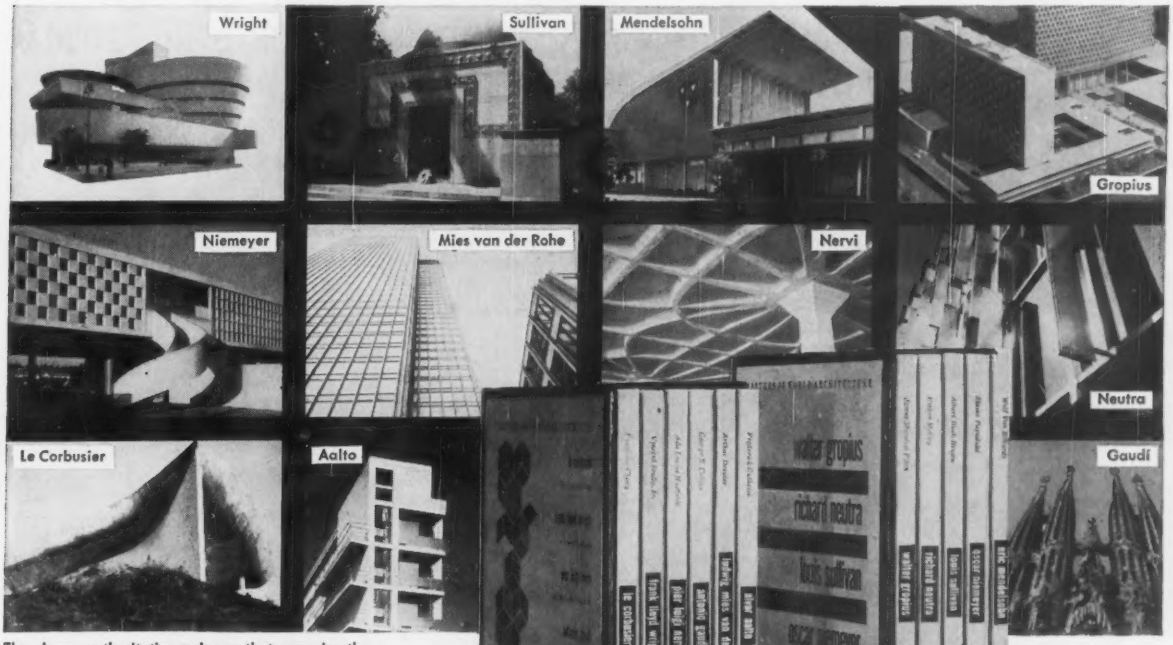

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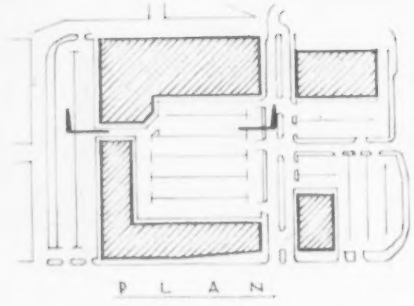

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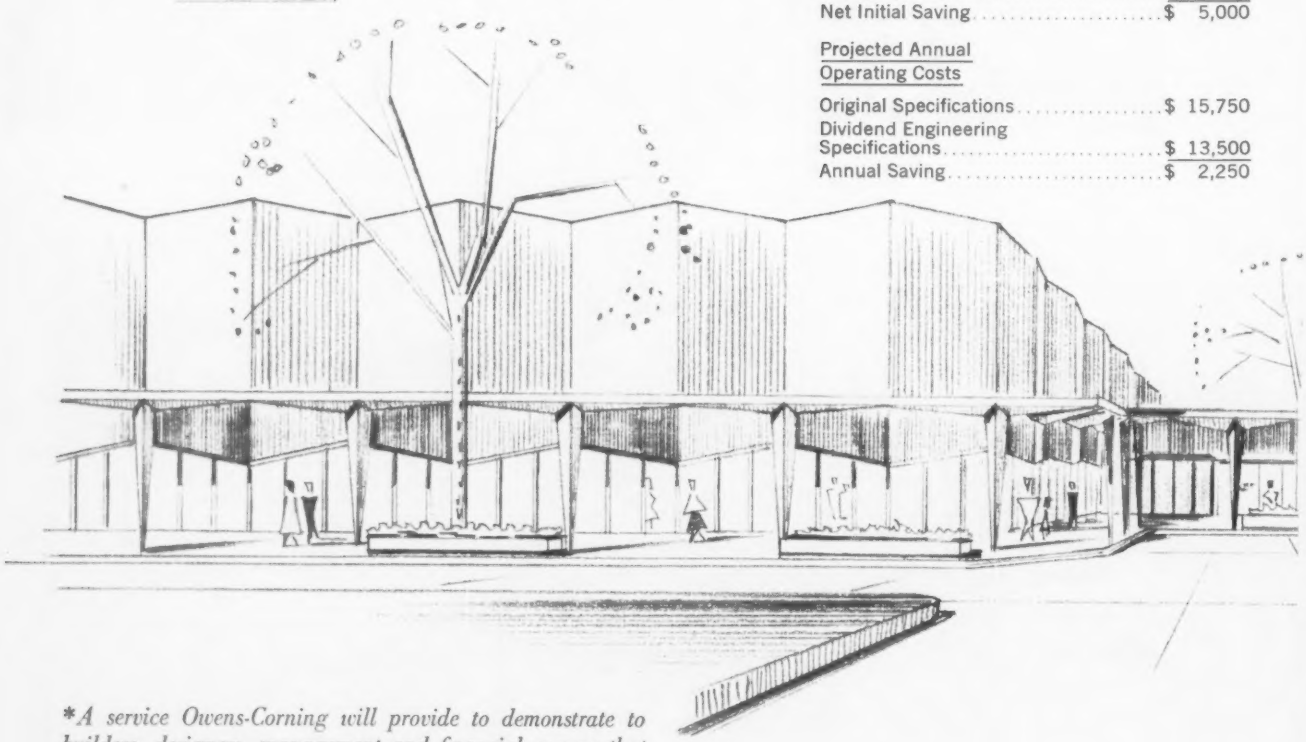

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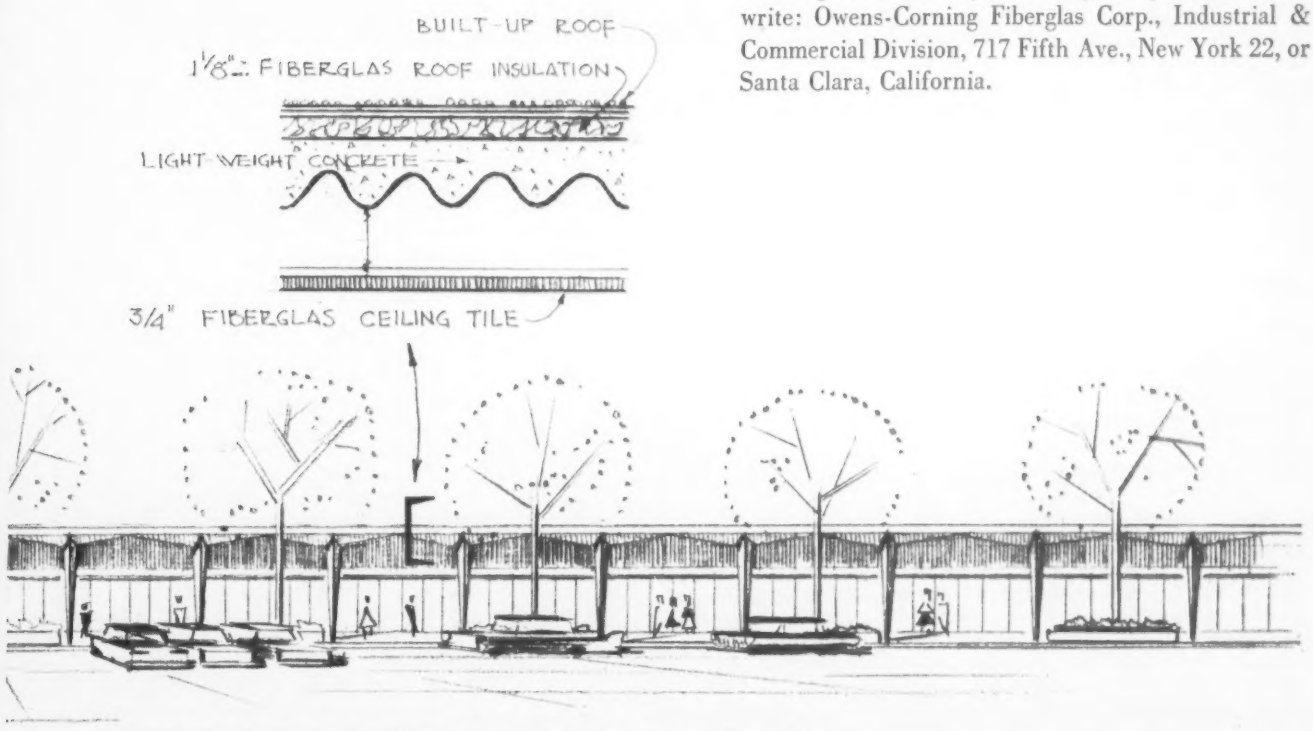

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REACTIONS TO PENNSYLVANIA STATION DEMOLITION

To the News Editor: First Tichy ruined the main space, now Luckman & Associates will complete the wreck. *Sic transit*. Pennsylvania Station was a helluva place to find anyone in; however, the contrast between the Baths of Caracalla and the Bibliothèque Nationale was intriguing and I hate to see it go. (How many times did I pass those portals, my sailor suit covered with soot, after a long train ride all the way from Philadelphia!)

It's distressing to see Pennsylvania Station destroyed—to be replaced by the particular proposed unpleasantness.

I have a good idea: If we can get the wreckers to leave the old room at the right moment stripped of its plaster decoration, etc., we might have a Piranesi right in the heart of New York—a real tourist attraction.

PERCIVAL GOODMAN
New York, N.Y.

To the News Editor: Penn Station was once a part of my daily life. I well recall the quaint sing-song of the train announcer's voice, required by the incredible acoustics. It is surely one of a few examples we have of a great space in this country. Naturally, I contemplate the destruction of this great hall with nostalgia and romantic regret.

On the other hand, I have hardly ever traveled by train in the last thirty years. I am more interested in promoting a space as meaningful for the air traveler today than in obstructing the contemplated re-use of Penn Station site.

ROBERT E. ALEXANDER
Robert E. Alexander & Associates
Los Angeles, Calif.

To the News Editor: The main hall of Penn Station is a unique space and irreplaceable. It is of minor importance that it is a full-scale replica of the Baths of Caracalla but of major importance that it is a grand and noble room. In our present intense concern with the urban scene, we need to be as careful of not destroying fine old landmarks as we are of building fine new ones. I suppose it all boils down to a question of judgment as to whether this building is sufficiently worth preserving to justify seeking a use for it somehow compatible with its size and character and location. My vote is a definite "yes"!

CLAUDE STOLLER
Marquis and Stoller
San Francisco, Calif.

To the News Editor: The problems surrounding Pennsylvania Station and the new Madison Square Garden . . . bring to mind an increasing problem that architects of the present day are faced with. That is having to build and develop primarily from the investor's point of view. In fact, the attitude of all things being determined on the basis of an economic analysis is bound to deprive society of some of its greatest potential.

I think further that any decision involving the demolishing of great buildings must be weighed principally on the basis of what it is that is to replace these great buildings. It seems that every great building that is demolished is replaced with an inferior "three-ring circus" structure.

In the case of the new Madison Square Garden, it seems to me that Manhattan contains many substandard areas where such a complex could be constructed. In this connection, I am at a loss to understand the role of various urban agencies which [have the power to] eliminate the arbitrary and capricious activities of the 20th-Century investor and his shadow architect.

WILLIAM KESSLER
Meathe, Kessler and Associates, Inc.
Grosse Pointe, Mich.

To the News Editor: I feel very much the way I did when the old Illinois Central Terminal here in New Orleans, designed by Louis Sullivan and altered several times by various architects, was demolished to make way for the new Union Passenger Terminal. What we got to replace the romantic old red-brick monstrosity was a white stone and marble structure without a soul. I am sure that the new terminal is much more functional for the railroads and their greatly diminished number of passengers, but the romance of the Sullivan building does not exist in its replacement.

There must be some more appropriate ground being freed by Urban Renewal (*a blessing nonexistent in Louisiana*) that could house the new Madison Square Garden, rather than destroying one of New York's most unique landmarks. I feel that the 34th-Street area around Penn Station needs some stimulus, but an observation tower overlooking Macy's might be more appropriate.

LOUIS A. GOLDSTEIN
New Orleans, La.

To the News Editor: The basic question is whether the Baths of Caracalla have ever been appropriate as a railroad ticketing center. The grandeur of the Third-Century space has been compromised by the clutter of Twentieth-Century functions. These

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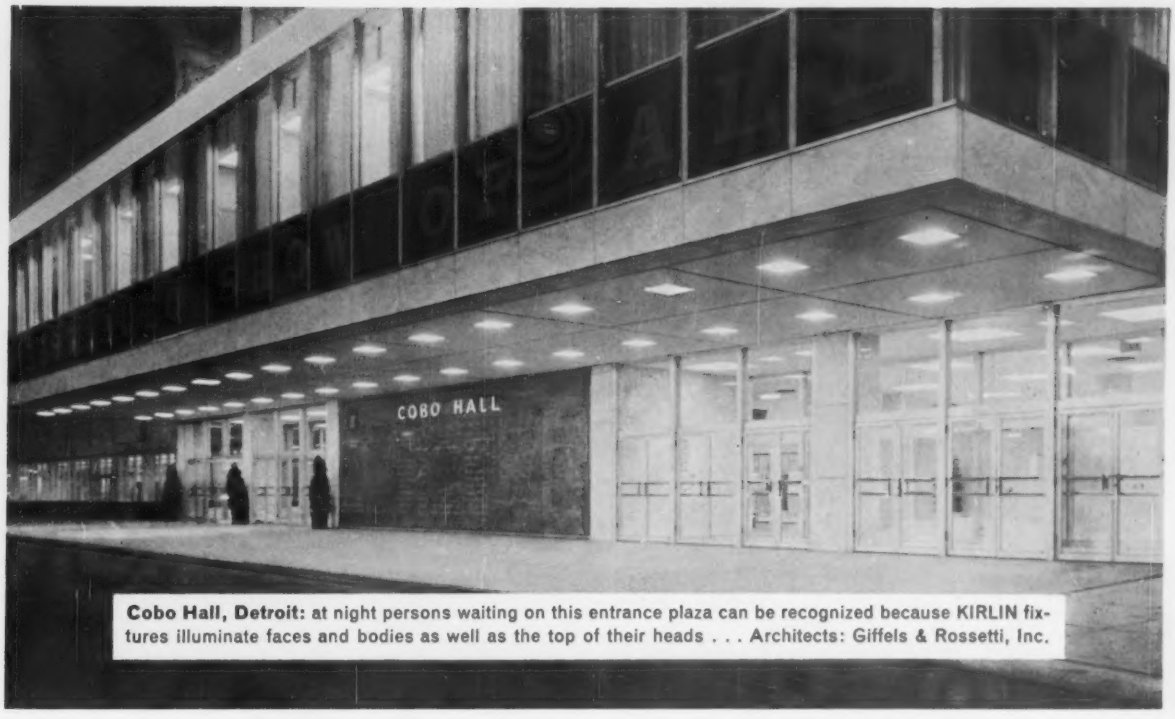

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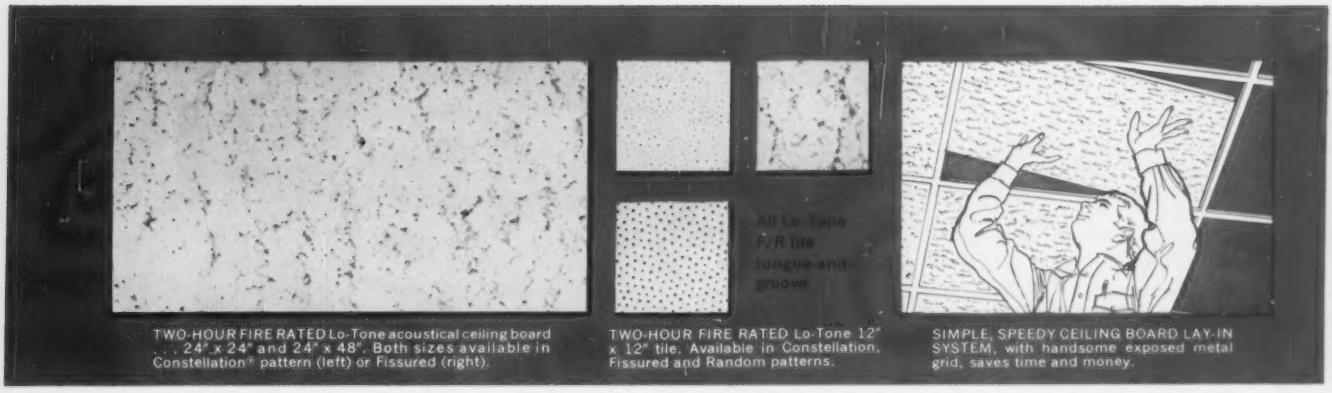

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Continued from page 78

operations dilute the experience sufficiently so that one should not hesitate to ask, "Is there a more logical way to house them?"

If we are to be sentimental about saving old monuments, let's at least preserve the original rather than the duplicate.

JOHN FIELD KELSEY
Ladd & Kelsey
Pasadena, Calif.

To the News Editor: I like the Baths of Caracalla.

W. C. MUCHOW
W. C. Muchow Associates
Denver, Colo.

To the News Editor: It is not without reservation that I [hear of] the removal of Pennsylvania Station. It is an exemplary pile of the philosophy of architecture that it represents, and, as one colleague put it, "one could hardly distinguish between the 'glass boxes' but for the charming old buildings separating them. The only character of the new buildings is the reflection of the old in the glass." However, it is the philosophy which created this type of architecture that is the crux of my opinion.

This neoclassic behemoth is "a monument to the stupidity of architects" (to quote another colleague). Designed and constructed more than a decade after the Chicago School had come into being, this building negates almost 1500 years of architectural progress. As was the vogue of that era, majesty could only be achieved by bastardizing a Greek or Roman temple; *ergo*, a multitude of our banks, libraries, and museums look like residue from a Caligulaean invasion. If we are to be a nation which reveres its heritage, let us preserve monuments to Americanism: i.e., the Stoughton House, Robie House, and even Lever House.

It has been said, comparing doctors with architects, that the medicos have the option of burying their mistakes. Let us not pass up this opportunity. The familiar are secure, but without venturing into the unfamiliar there can be no progress.

JOHN B. TEN EYCK
Lusk & Wallace
Colorado Springs, Colo.

To the News Editor: The proposals, within the past few years, for demolishing both Pennsylvania Station and Grand Central Terminal, are symptoms of more assaults on the spatial world yet to come. The two terminals are public parks, public open space, public rooms. Like Washington Square and Central Park, they are under siege. As architects, we must fight for their preservation, not only for their own sake, but out of a sense of self-preservation. But the real fight is not as architects, but as citizens of a city, the public owners of open spaces. We must work for public action to maintain and give continued life and activity to these great spaces. For without continued life, perhaps new kinds of life, they will be dead and gone anyway.

ROBERT L. GEDDES
Geddes-Brecher-Qualls-Cunningham
Philadelphia, Pa.

To the News Editor: I have rather an adverse reaction to the proposed demolition of the Pennsylvania Station, coupled with the realization that the only buildings and monuments which can be expected to survive are those which, like the pyramids of Egypt and Central America, are too much trouble to take down. Our technology is presently adequate to protect a building from most natural disasters, but not from the peculiarly American passion for living in the present, thinking in the future, and relegating the past to the dustbin.

This is not a protest against the design of the new Madison Square Garden. From the sketches and descriptive material I have seen, it seems to have many admirable features and to be well suited to its purpose. It seems, however, that it could have replaced any number of New York buildings of considerably less character, charm, and antiquarian interest than the Pennsylvania Station.

It seems a shame to lose this monument to a lively past just at the point when architecture seems to be rediscovering the exhilaration of soaring interior space and relearning the language of ornament and scale. Perhaps what is needed is some latter-day tycoon to dismantle the whole building and patiently re-erect it beam by beam, stone by stone, in some secluded area of the city, or the nation, where it will not jam the wheels of unheeding progress.

Who knows, perhaps our grandchildren will find it necessary to tear down the antiquated and outmoded Madison Square Garden (Charles Luckman Associates), with its no-longer fashionable saddle roof and replace it with a modern structure resembling Westminster Abbey.

Seriously, the problem in New York, and indeed all of our cities, seems to be that we are building individual buildings at a time when we very well know that we should be building a city. The resulting effect is much like that of a garden full of strange and wonderful weeds choking the pathways, struggling for the sun and shutting the light out from each other. Nowhere does this seem more true than in New York, where tall buildings, which would be an ornament to many other cities, are being torn down to make room for even taller ones with faster elevators and central air conditioning.

Detroit is no stranger to this question, as you will recall from our recent controversy over our old City Hall, a building of considerably less intrinsic merit than the Pennsylvania Station, but still a time-hallowed link with the city's past. It seems doubtful whether we shall have anything of equal character to replace it.

LYNDON WELCH
Eberle M. Smith Associates, Inc.
Detroit, Mich.

To the News Editor: Like the Grand Central Terminal, Pennsylvania Station is to many people a symbol and a gateway to New York City. This great space, although recently tampered with—to its detriment—should be preserved. It is a monument to an era when New York had a dynamic growth, and it is also a landmark in the architectural history of this city. Other great cities in the world preserve and use such buildings.

Since we can hardly afford to build such magnificent interior spaces given today's economy, it seems a pity to destroy all of our past.

HUGH STUBBINS
Hugh Stubbins & Associates, Inc.
Cambridge, Mass.

To the News Editor: The "present Baths-of-Caracalla space" has been dead for years. The space never survived the sweeping intrusion of the canopy over the ticket counters, and the hawking diversions of advertising displays.

It remains to be seen if the present space will be replaced with a better one.

HERBERT H. SWINBURNE
Nolen & Swinburne
Philadelphia, Pa.

To the News Editor: Apparently, this time there are more than strong plans to demolish Stanford White's Pennsylvania Station complex. My sorrow in the matter concerns not only the "Baths of Caracalla" space but the adjacent glass and steel train shed. Unfortunately, both have been modified drastically since the original conceptual design: (a) by Lester Tichy's brilliantly illuminated intrusion into the "Baths" space, where mere light intensity manages to destroy form; and (b) by covering of the open train concourses (which I never saw in their original state, but of which a delightful photograph appears in Mumford's *Sticks and Stones*).

Continued on page 84

For more information, circle No. 410 ➤

Commons Room of Memorial Union Building, Oregon State College, Corvallis, Oregon. Architects: Church, Newberry, Roehr & Schuette, Portland. Engineers: Cooper & Rose', Portland. Contractors. A. V. Peterson Co., Portland.

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Continued from page 82

The new structures proposed are superficial and thoughtless. The present station complex, with its monumental spatial drama behind a uniform and strongly modulated street façade, will be replaced with another uniform but bland street façade, with no interior space, save that which is functionally unrelated: Madison Square Garden (at a stylish, first-year-design student's level). The second most important entrance to New York, historically, will have become merely, in fact, an underground labyrinth with no point of arrival or departure except in the sense that people, like so many IBM cards, will go into their predetermined slots.

There is obviously no answer to this continuing destruction of transportation terminals other than purchase by the Government (i.e., Port of New York Authority, in this case) and operation by it as a public service facility. The total range of these terminals should include Idlewild, La Guardia, and Newark Airports, Pennsylvania and Grand Central Terminals, the bridges, tunnels, and piers of New York. All, except the railroad terminals—the oldest and most venerable form of arrival—are presently part of the Authority.

It follows, therefore, that the Pennsylvania complex, as well as that of Grand Central, should be purchased and operated by the Port Authority, *a far sounder activity functionally, financially, and aesthetically* than the erection of bulbous coliseums unrelated to the Authority's purpose. First things first.

NORVAL WHITE
New York, N.Y.

To the News Editor: It seems to me that the station suffered three strikes against it when they put that overgrown pterodactyl in the concourse—thoroughly ruining the wonderful space, baths, railroad station—whatever it is.

THEODORE C. BERNARDI
Wurster, Bernardi & Emmons
San Francisco, Calif.

To the News Editor: I can honestly say that I have no choice between a McKim, Mead and White eclecticism and a Charles Luckman eclecticism. To one who feels a strong negative impulse to both of these types of architectural effort, I can tell you that nothing matters less.

JOHN BYRON HACKLER
Foley-Hackler-Thompson-Lee
Peoria, Ill.

To the News Editor: I have never admired the building as an architectural masterpiece, although, as a European, I have never understood why good existing buildings in this country should be torn down when we have plenty of space to build in areas not already occupied by useful buildings. From an architectural point of view, I personally would not miss Penn Station.

Offhand, I should think that, if the Pennsylvania Railroad wants to go underground, the existing building could be used for other purposes, but I have felt for a long time that as a railroad station it has been outmoded.

A. G. JAN RUHTENBERG
Colorado Springs, Colo.

To the News Editor: To my mind, the Pennsylvania Station—what I have seen of it in photographs—is a very fine building. It is one of the few examples of building in a classical style that has been executed in a living and refined manner, giving the surroundings the impressive scale which it itself possesses. In this respect, I recall also a beautiful photograph of the big hall!

I would regret it very much if the building were to be demolished; it should, if at all possible, be preserved.

J. J. P. OUD
Wassenaar, The Netherlands

To the News Editor: This is one of America's finest buildings. I think it would be a brutality to destroy it.

It is one of the fine plans—simple and magnificent. Its rooms and its heights have something for the human spirit that 8-ft-high ceilings do not have.

The banality recently built inside is sufficient testimony to the bad taste of the architect and the deterioration of the Pennsylvania Railroad management. When the station was built, the Pennsylvania Railroad accepted the idea that this great building, without a tower of many stories above it would give a greater degree of dignity to the railroad and the city. It did. It was worth doing the way it was done. Hail to these individuals who thought and acted like men. Obviously the architects and the railroad management, who now wish to destroy it, have never been to Rome, and have no notion of the fundamentals that make it, as well all fine contemporary architecture, great.

HENRY J. TOOMBS
Toombs, Amisano & Wells
Atlanta, Ga.

To the News Editor: It is disgraceful that we have to be constantly on our guard and take time to fight off the vultures who have no feelings for historical and artistic monuments and for what open spaces they have not already sequestrated from us. The architect is supposed to help society control the environment, but it is rather incongruous that frequently, when we are fighting an avaricious interest, we also have to fight our own colleagues who conspire with the predators for a fast buck. Perhaps we should have an oath of the type doctors take, which would make it at least hazardous for an architect to conspire against our cultural domain.

I said "constantly on our guard," because first it was the attempted rape of Grand Central Station, then the proposal to despoil Welfare Island (fortunately this real estate nightmare is so impractical that it is not likely to see daylight), then we had the case of the sculptures and approaches to one of our East River bridges. (I suggest the bridge sculptures and approaches be placed on Welfare Island and combined with other elements to be made into a Roosevelt Memorial of our own.) And, now, Pennsylvania Station! (I believe it to be more beautiful and functionally more workable than Grand Central Station). Tomorrow, it will be something else. . . .

These are not isolated cases. They are part of a pattern, and the more Manhattan becomes crowded, the more will real estaters (with the aid of architects) seek to despoil our already meager cultural and natural treasures.

What can we do? Arise—man the barricades!

ISADORE ROSENFIELD
Isadore & Zachary Rosenfield
New York, N.Y.

To the News Editor: I am writing to protest strongly plans to tear down the Pennsylvania Station in order to construct on the site the new Madison Square Garden.

I am presently working on a book on Stanford White, which, I hope, will not only be a biography of White, but also a portrait of the age and a reappraisal of the architecture of the so-called Eclectic Period. The Pennsylvania Station—which is, of course, McKim's—is one of the few remaining monuments of the period. As I point out in my book, the fact that the passenger handling section is based on the grandeur of Rome, and the train departure and arrival section frankly expresses its construction, is a significant and illuminating example of the thinking of the age. Although the interior has been almost entirely ruined, its great space and nobility are still visible.

Far from endorsing the demolition of this building, I would do everything possible to urge its restoration and imaginative re-thinking in order to make it again functional.

ALINE B. SAARINEN
Bloomfield Hills, Mich.

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Foreign Affairs Take Front Seat in Washington

by E. E. Halmos, Jr.

The sudden and almost total Washington preoccupation with international dangers will have at least three relatively immediate effects on architects and the construction industry in general:

a. It will probably mean a hold-down on some Federal spending in areas not connected with defense.

b. Most legislation still pending—and there's a vast amount of it—will languish in the Congressional hoppers until next January.

c. There will be a revival of interest in construction of some sort of shelters for the civilian population—a program that will involve Federal construction money in the neighborhood of $200 million or more.

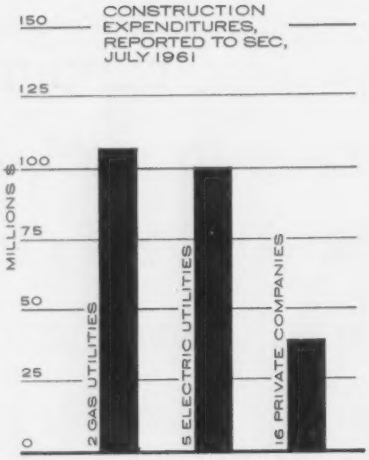
Any construction hold-down will be a little while in coming, but it seems inevitable. The only real criticism of President Kennedy's actions and messages on the international situation came on the question of reducing other spending, if the nation is to pump another $3.5 billion into an already huge ($43 billion) defense budget.

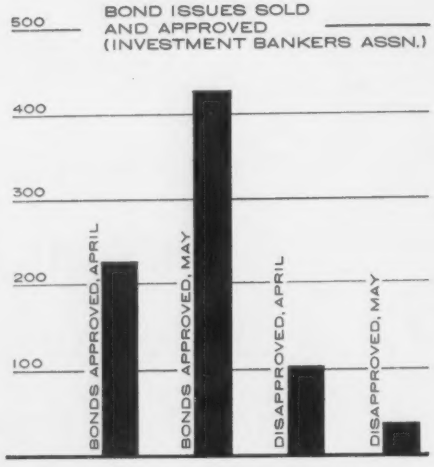
The obvious point—that with a national deficit for fiscal year 1962 now estimated to run $6 billion or more, there should be some cutback in other spending—provides a rallying point for conservatives of both parties. In early August, their efforts hadn't been successful: the Senate flatly refused to cut appropriations for the Department of Labor, Health-Education-Welfare and other agencies, for which more money had been appropriated than President Kennedy had asked.

But it is certain that every new request for money will come under vigorous attack, thus making equally certain that the Administration will be increasingly circumspect about new money requests that it can't justify as necessary for defense.

By the same token, it seems clear that "go slow" tactics will be followed even on some of the programs for which funds have already been authorized—such as the new housing program, some construction of Federal office and other buildings, and perhaps even some rivers and harbors and similar projects.

The increasing querulousness of Congress on this score would seem to indicate that many agencies will follow a prudent course in spending matters.





BOND ELECTION RESULTS – JUNE 1961 BY USE OF PROCEEDS

USE OF PROCEEDS	APPROVED		DISAPPROVED	
	AMOUNT	NO	AMOUNT	NO
EDUCATION:				
ELEM. & SEC.	89,098,000	73	29,713,000	31
OTHER	579,000	2	—	0
ROADS & BRIDGES	6,028,000	6	2,900,000	4
WATER & SEWER	281,903,000	26	621,000	5
OTHER UTILITIES	3,000,000	1	—	0
HEALTH & WELFARE	775,000	1	245,000	1
RECREATION	1,233,000	2	522,000	3
PORTS & AIRPORTS	14,200,000	1	20,000	1
INDUSTRIAL	1,500,000	1	202,000	1
REFUNDING	40,000	1	—	0
FLOOD CONTROL	—	0	—	0
PUBLIC HOUSING	—	0	—	0
VETERANS AID	—	0	—	0
ADMIN. & OFFICE BLDG.	7,400,000	21	1,100,000	2
UNCLASSIFIED	22,180,000	6	140,000	1
TOTALS	$427,936,000	122	$35,463,000	49

BOND ELECTIONS SCHEDULED AS OF JUNE, 1961

MONTH	AMOUNT
1962	
APRIL	5,000,000
NOVEMBER	4,000,000
MARCH	—
APRIL	—
MAY	—
JUNE	269,832,000
JULY	22,000,000
AUGUST	1,089,000
SEPTEMBER	31,624,000
OCTOBER	4,340,000
NOVEMBER	1,249,236,000
DECEMBER	—
NO DATE SET	84,828,000
TOTAL	$1,671,949,000

USE OF PROCEEDS	AMOUNT
EDUCATION:	
ELEM. & SEC.	79,030,000
OTHER	4,200,000
ROADS & BRIDGES	34,830,000
WATER & SEWER	258,395,000
OTHER UTILITIES	921,506,000
HEALTH & WELFARE	31,677,000
RECREATION	9,365,000
PORTS & AIRPORTS	130,758,000
INDUSTRIAL	150,000
REFUNDING	—
FLOOD CONTROL	130,000,000
PUBLIC HOUSING	1,000,000
VETERANS AID	—
ADMIN. & OFFICE BLDG.	1,253,000
UNCLASSIFIED	69,785,000
TOTAL	$1,671,949,000

Slowdown on Bills

As to legislation, a combination of circumstances added to the foreign situation militates against very much more being produced this session. (Of course, since Congress has a two-year "life," bills not acted on now don't "die": they remain intact until next January.)

As of the first week of August, the number of bills that had been introduced totaled somewhat more than 14,000; the number of bills of any real significance that had become law totaled fewer than 60.

Continued on page 88

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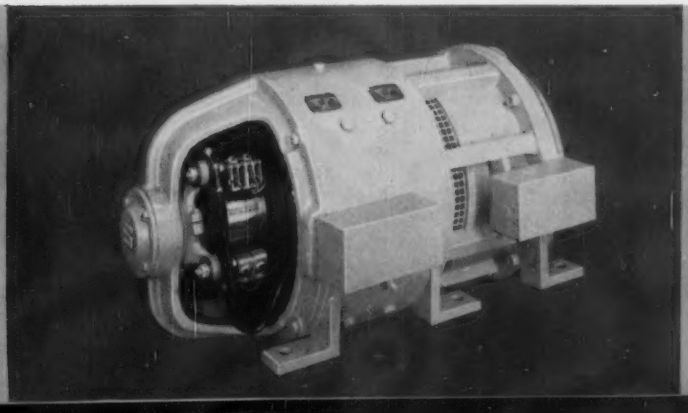

DOVER ELEVATORS

FINE ELEVATORS SINCE 1861

DOVER

Continued from page 86

Still facing Congress as Washington's muggy summer descended were a number of major issues that bid fair to occupy what time remained until the lawmakers are ready to pack their bags and go home (probably near the end of September, barring an increase in international tensions).

Still to be decided, in early August, were such matters as major tax reforms; foreign aid; some sort of a school bill; and most departmental appropriations bills.

That left well back in the ruck many matters of direct interest to architects: establishment of a Department of Urban Affairs; various bills to increase pay and status of professionals; attempts to co-ordinate construction efforts of the Government; some price-regulation legislation that would affect building material prices; and much more.

CIVIL DEFENSE

In the present Congressional mood of bipartisan support for defense measures of almost any kind, there has been no doubt that the President's shelter program would be approved.

But the program proposed by the Defense Department is markedly different from the sometimes grandiose plans of Civil Defense planners: It calls for shelters to be built (or established) in existing Government buildings, private offices, factories, schools, and churches—but none for individual homes and apartments. In addition, the shelters would be stocked and constructed primarily for protection of occupants against fall-out, not against blast.

Military thinking (and you'll recall that under recent Presidential orders, the military is now responsible for civil defense) is that such shelters are both more feasible and practical than any plan for individual protection: They'd be located where most people are concentrated (or can easily concentrate), and a shelter back home in the suburbs would be of little use to a factory worker at the plant, though it might help his family. However, since the target would most likely be the city center, it seems more logical to provide protection there.

Aid to Education

The apparent strangulation of the Administration's major aid-to-education bills doesn't mean that the politically important "impacted areas" feature will be allowed to disappear.

As you know, this program (it ended officially on June 30) makes payments to school districts where big Federal installations contribute to overpopulation of school facilities. More than 300 of the 437 Congressmen come from districts that have been receiving payments under this program—and you can be sure they will see to it that the payments are continued.

As to the $2.5 billion (or more) Administration program, you can take it that many Congressmen weren't very unhappy to see it die in the Rules Committee: that took them off the hook on voting on this controversial measure. It was unfortunate that the death-rites were conducted on religious grounds (failure to provide aid for parochial schools). There were ample other reasons for a tough battle—principally the very real fear that Federal contributions to teachers' salaries would mean Federal control of school curricula.

Post Office Program

The Post Office Department, which is pushing hard on its construction-leasing program, has just joined with the Commerce Department to get added publicity for its efforts.

Current PO program calls for a total of 2,409 projects (including 272 modernization jobs), valued at $190.4 million, to be let within the current year.

Architects will recall that when the General Services Administration ended its own lease-purchase program a couple of years ago—after a fairly dismal failure—Post Office continued vigorously with its own version. There's a major difference: Post Office simply agrees to lease buildings, built by private investors to PO specifications, for a period of years and with an option to buy at the expiration of the lease. GSA definitely agreed to buy. (PO, of course, doesn't want to be tied to a fixed site, and wants to be free to move its operations if population or business shifts dictate.)

So far, PO's program seems to have been readily accepted. Up to the end of July, a total of 1267 contracts, valued at $85 million, had been awarded under the program.

Under the agreement with Commerce, PO will provide details on its construction-leasing proposals, which will be printed as received in the "Synopsis of Proposed Procurement, Sales and Contract Awards" published daily by Commerce.

New Post for Public Works

Among the many Congressional attempts to bring some sort of order out of the Government's varied construction programs is a new bill (HR 7449) which would create a new post of "Public Works Co-ordinator."

The bill seems to have no chance of enactment, but provisions are interesting for the hint they give of what might be coming up later:

The "co-ordinator" would be a Presidential appointee who would be empowered to collect information from heads of departments and agencies that have authority to construct public works, and would review this information and determine "the method and extent to which the policy of each department or agency is and should be co-ordinated with the over-all policy of the Federal Government."

REACTOR REACTIONS

Congressional action on the $246.4 million construction appropriation for the Atomic Energy Commission showed the heavy split over the traditional public *vs.* private power argument. There was no debate at all over funds for a two-mile long linear accelerator for Stanford University (to cost an eventual $114 million); but the House knocked out a $95 million item for construction of a steam-generating station that would utilize waste heat from the Hanford reactor. The Senate restored the $95 million—but House parliamentarians quickly shuttled the bill into the Rules Committee, where, as August began, it rested quietly.

FINANCIAL

Although utility company planning had slowed in a traditional midsummer trend, all other signs checked by P/A continued to indicate a strong upward trend in the construction industry. In fact, on P/A's charts, (p. 86), probably the most encouraging sign for long-term benefit to architects was the increasing number and value of projects being announced by nonutility companies.

A second strong support was the obvious continued willingness of voters to approve bond issues for public works, with the total approved in May (last available figure) topping April by close to $100 million.

Still another indicator was the report of the Census Bureau that housing starts were now running at a seasonally adjusted rate of 1,374,000 units in June—highest since December of 1959. At the same time, there was ample indication of continuing ease in the money markets; and construction machinery shipments, long the "sick man" of the industry, showed a healthy pickup (to $221 million) in the first quarter of the current year.

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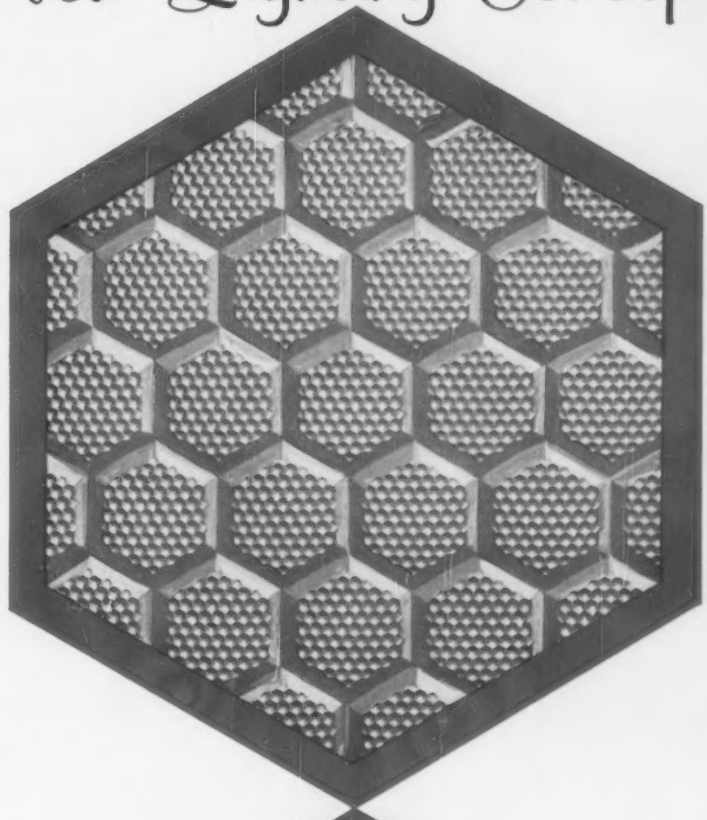

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John Crouch, Crouch-Walker Company

ON THE CHICAGO FIRE ACADEMY JOB, MASONRY CONTRACTOR CROUCH-WALKER DEMONSTRATES

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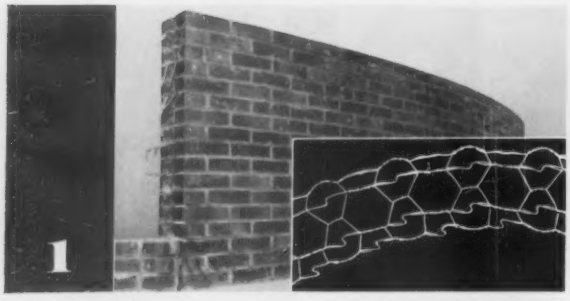

TAKING CURVES . . . to provide continuous reinforcement strength throughout the length of this curving wall, it was found that only Keywall could do the job. Crimped at intervals in order to curve, Keywall retained its strength. Only Keywall can be curved to reinforce unusual shapes.

TIES IN . . . Many wall sections were left unfinished for other work to progress. For continuous reinforcement, Keywall was used. Bill Revers of Crouch-Walker, shows the Keywall "tails" to be tied in later. Only Keywall can be tied in. Only Keywall is flexible enough to accommodate variations in mortar joint levels.

The new Chicago Fire Academy will cover 62,500 square feet, cost $1,700,000 without furnishings. Fire escapes, window balconies and smoke and sprinkler rooms will make possible the simulation of all fire control and extinguishing problems. A swimming pool jn the basement will have a 25 x 75 ft. underwater observation window that will enable viewing of underwater demolition and life saving demonstrations.

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MASONRY CONTRACTOR: Crouch-Walker Company, Chicago

Keywall reinforcement can do

UNIFORM MORTAR JOINTS . . . In doing fine tile work (or any good masonry work), uniform, mortar joints are necessary. Only Keywall can be lapped without lumping up the mortar joint. That's why the architects and Crouch-Walker used it on the tile work for the Chicago Fire Academy job.

The masonry contracting firm of Crouch-Walker, Chicago, Ill., was faced with a number of knotty reinforcement problems on the Chicago Fire Academy job. They ranged from fine tile work to curving brick walls. The architect and Crouch-Walker decided on Keywall as the solution of all 3 demands (at left). Perhaps Keywall can solve your masonry reinforcement problems, too.

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UIA CONGRESS

by Eugene D. Sternberg

The 6th Congress of the UIA (International Union of Architects) has just concluded in London. It was attended by almost 2000 participants from 64 countries. The official business of the Congress was discussion of three papers on "Architecture and Technology" by Henry-Russell Hitchcock, Pier Luigi Nervi, and Jerzy Hryniewiecki. Each afternoon tours were arranged to new developments in housing, schools, and industrial and office buildings, with a discreet look in passing at some of London's more famous historical works. The final plenary session of the Congress listened to a masterly summary of the discussions by J.M. Richards, and applauded the award of the Abercrombie and Perret Awards to a group of British architects for their work in prefab schools, and to Stockholm for its sustained achievements in town planning.

What does an international conference really accomplish? Undoubtedly the primary benefits accrue to the host country. The British took this Congress very seriously, realizing that it may be more than 100 years before the Congress again comes to Britain. The gay, deliberately temporary UIA headquarters and exhibition hall provoked extensive public attention. The major newspapers came out with first-class supplements or sections devoted to recent achievements in British architecture and town planning. Every conceivable allied organization staged exhibits. Royal blessing was given—the Congress was opened by Antony Armstrong-Jones and visited by an alert and interested Duke of Edinburgh.

For working sessions, the whole group was divided into three sections. All were promptly and fully attended —as were the tours and plenary sessions. But most people realized that the real fruit of such a gathering is first, what is to be seen, and second, the opportunity of free and informal exchange of views with architects of many different countries. "Verbal architecture" as one speaker characterized it, is rarely of much importance. From the discussions two main impressions emerged: There is a widespread and deep concern about the long-term direction of architecture; how can the architectural profession ensure that man is always using the machine for his own ends, and not being used by it? The second problem was that, at present, in most parts of the world, the great and pressing problems of architects are social problems—how to house millions of people cheaply and decently, how to build schools quickly and inexpensively, how to aid emerging industrialism with light, efficient, and economical buildings.

As far as I know, there was no effort on the part of AIA or any official body to encourage attendance from the U.S., and the results were as may be imagined. There was a small official delegation, and a sprinkling of individuals who were able and interested in combining the Congress with other business or pleasure in Europe. It was disquieting to feel that the U.S. representation was so scattered and so small that it would have made no difference had it not been there at all. Considering the high standards of architectural design in the U.S., and the great contributions we are making to the development of new techniques and new materials, and considering further how very seriously most other countries on both sides of the Iron Curtain took this assembly, our effort was not enough.

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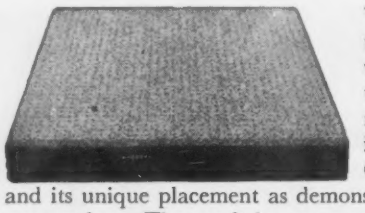

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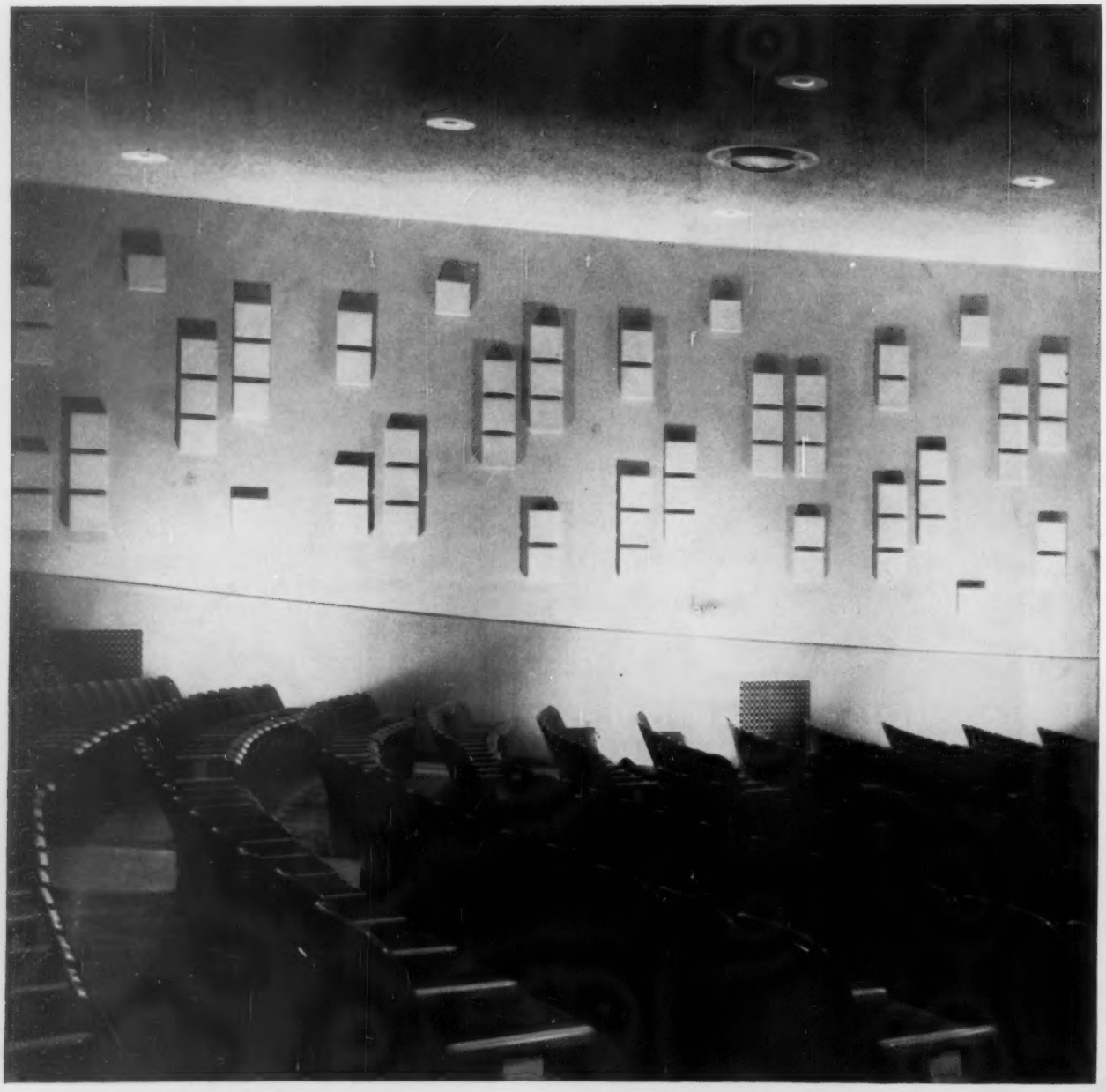

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Acoustical Consultant: Michael J. Kodaras, Long Island City, N.Y.
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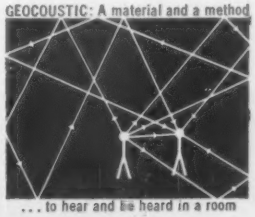
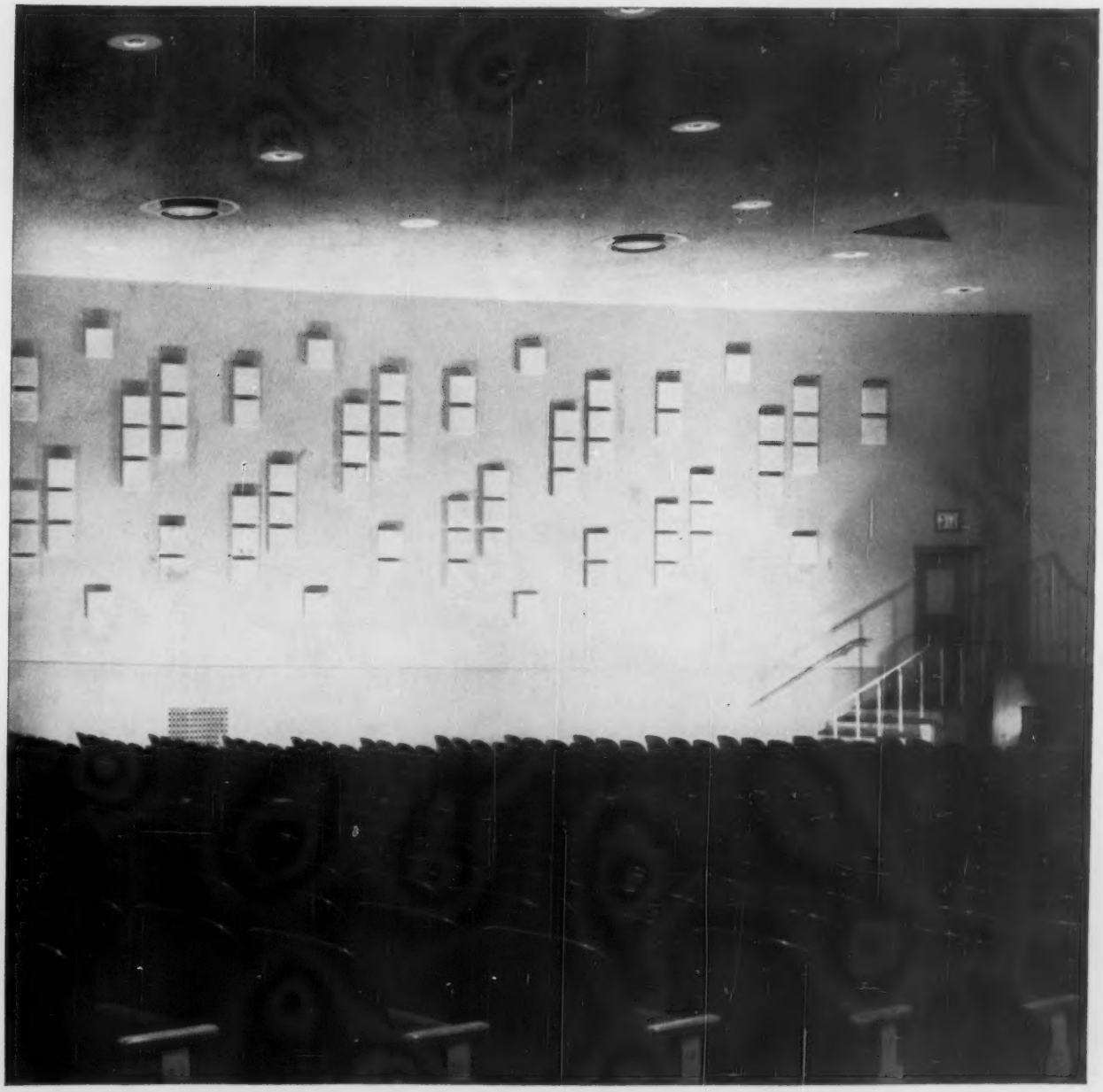


. . . to hear and be heard in a room



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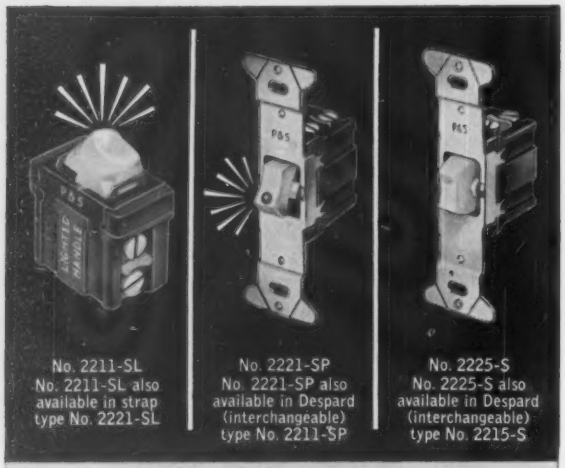

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The most important advancement in fire safety ever made in woodfiber acoustical materials. Exclusive with Simpson!

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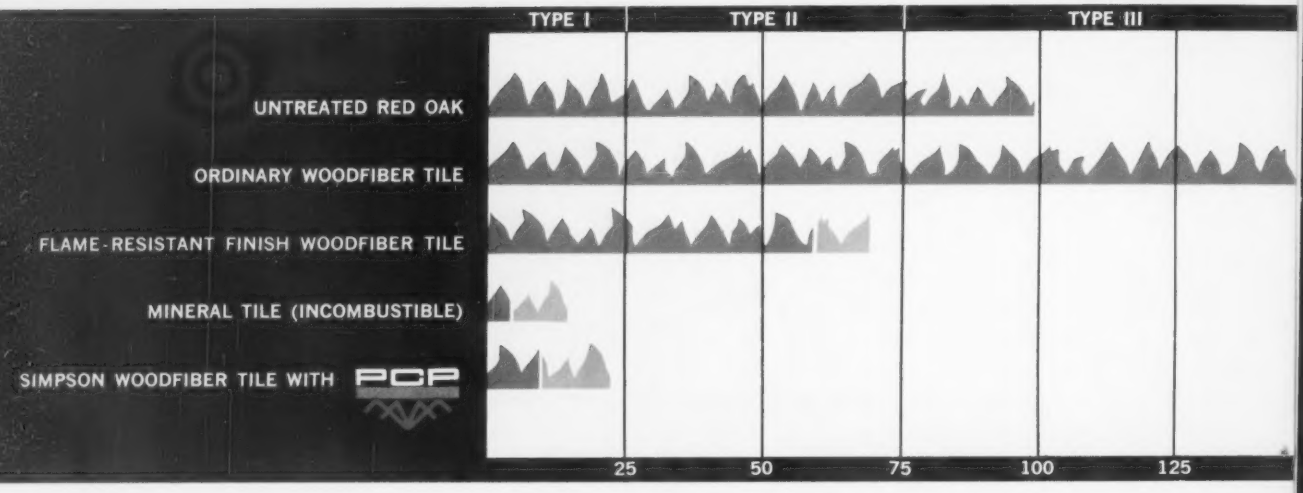
PYRO-CHEM PROTECTION (PCP) GIVES YOU TYPE I FLAME-SPREAD RATING IN A COMPLETE LINE OF ACOUSTICAL PRODUCTS

RELY ON Simpson QUALITY BUILDING PRODUCTS



PCP acoustical tile certified as Type I, E84-60T

	Pyro-Chem Protected woodfiber tile	Flame-resistant finish woodfiber tile*	Mineral tile (incombustible)
Flame-Spread	10 - 23	60 - 70	5 - 15
Fuel Contributed	23 - 27	42 - 44	25 - 29

*Simpson FRF rating — other cellulose tiles rate up to 100 and over

Untreated red oak — rated at 100 Asbestos rated at — 0
Type I 0 - 25 Type II 26 - 75 Type III 76 - 200

Note: PCP Forestone was tested by a leading independent research institute. Name of laboratory and complete test results upon request.

PYRO CHEM PROTECTION PCP

SIMPSON HAS DEVELOPED PYRO-CHEM — an exclusive process that impregnates every fiber with fire-proofing chemicals. In recent tests conducted by a leading independent research institute (name on request) Simpson PCP woodfiber tiles scored flame-spread ratings as low as 13 — all within the 0 to 25 range required for certification as a Type I material under ASTM E84-60T Tunnel Test.

Woodfiber acoustical tile is accepted as the most economical product to provide effective noise control. Simpson woodfiber tile with flame-resistant finish is equal or superior to any surface treatment available. But until today architects, contractors and building committees have been forced to more expensive materials when a Type I flame-spread rating is required.

WHAT THE TUNNEL TEST TELLS YOU ABOUT FIRE HAZARDS

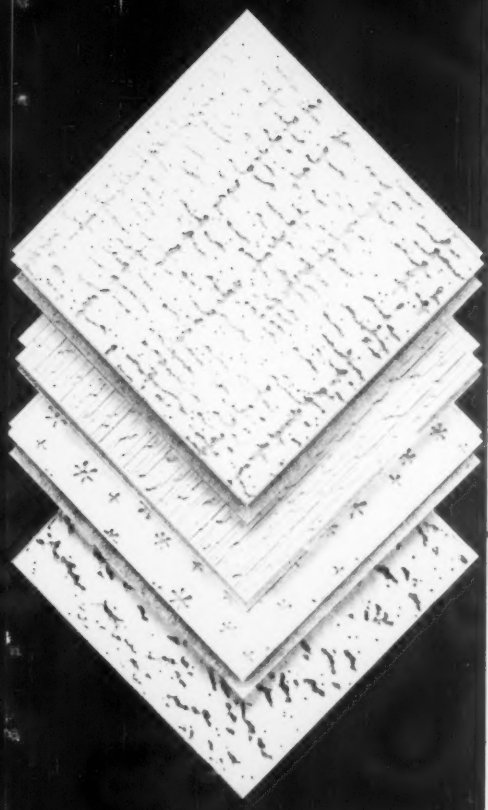
The tunnel test (used to test the efficiency of Pyro-Chem) measures how far a building material will propagate a flame from an outside fuel source. It simulates actual fire conditions under laboratory control. This tunnel test was developed by the American Society for Testing Materials. It is accepted by the Acoustical Materials Association, Building Officials Conference of America, and Uniform Building Codes of the International Building Officials Conference.

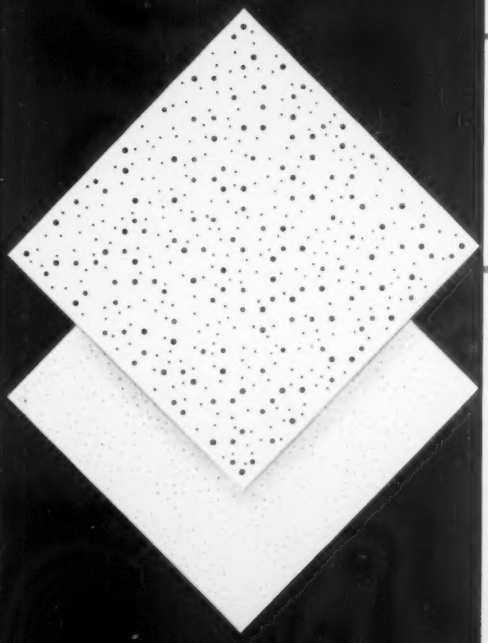
SAVE UP TO 1/3

Now you can have Type I flame-spread protection equal to that of mineral tile costing up to 15 cents more per square foot. Simpson PCP acoustical tile is far superior to ordinary woodfiber tiles, yet costs only pennies more per foot.

PCP ACOUSTICAL TILE PYRO-CHEM PROTECTION AVAILABLE IN SEVEN PATTERNS

Simpson offers a complete variety of sizes, thicknesses, and surfaces. Four textures are available in Forestone® PCP plus two perforated PCP patterns. This makes it possible to select the specific combination of beauty, noise control, economy, and fire safety required for each installation.





Simpson

PCP

PYRO-CHEM PROTECTION

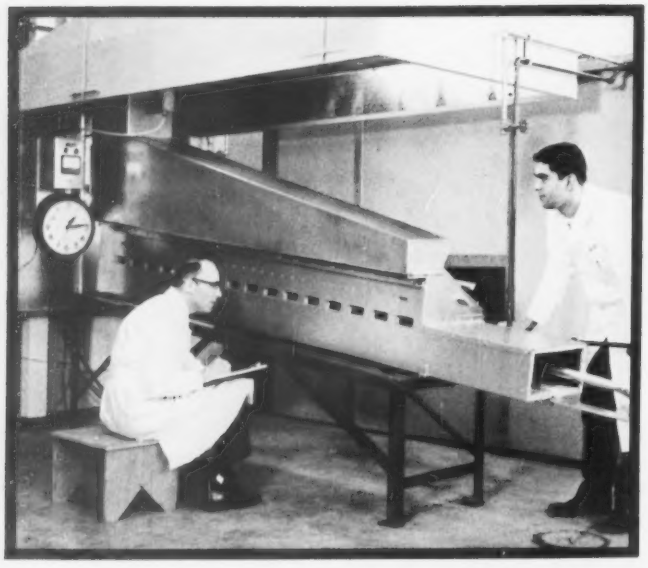
PCP ACOUSTICAL PRODUCTS

SIMPSON PRODUCT	THICK-NESSES	SIZES	TYPE EDGE	INSTALLATION METHODS	FIRE HAZARD CLASSIFICATION	EFFICIENCY* (NOISE RED. COEF.)
FORESTONE TEXTURES						
DRIFTWOOD PCP	9/16"	12" x 12"	Flange joint	Stapling or nailing	ASTM E 84-60T Type I Flame-Spread 10 - 23	.60 to .70 depending on thickness and method of installation
STRIATED PCP	9/16"	12" x 12"	Beveled, kerfed & rabbeted	Cementing, nailing or mechanical suspension		
STARLITE PCP	9/16"	12" x 12"				
FORESTONE FISSURED PCP	9/16" 3/4"	12" x 12"	Beveled	Cementing, nailing or mechanical suspension	ASTM E 84-60T Type I Flame-Spread 10 - 23	.60 to .70 depending on thickness and method of installation
	9/16" 3/4"	12" x 24"	Flange joint centerscored	Stapling, nailing or mechanical suspension		
	3/4"	12" x 23-3/4"	Beveled, kerfed & rabbeted	Exposed Z or T mechanical suspension		
PERFORATED PATTERNS						
RANDOM DRILLED PCP	1/2"	12" x 12"	Beveled	Cementing, nailing or mechanical suspension	ASTM E 84-60T Type I Flame-Spread 10 - 23	.60 to .75 depending on thickness and installation method
	3/4"	12" x 24"	Centerscored			
PETITE PCP	1/2" 3/4"	12" x 24"	Flange joint centerscored	Cementing, nailing or stapling, mechanical suspension		

*Figures given are for untreated tiles.
Ratings for PCP tiles are not yet available,
but they are expected to correlate
closely with those for untreated tiles.
See Sweet's catalog (11a Sim) for complete tables.

The Los Angeles Fire Department, recognizing the importance of the problem, has been conducting full-scale experiments for several years to determine performance of various materials under actual fire conditions. Their experiments have proved a very close correlation between performance under actual fire conditions and tunnel test ratings.

Forestone is patented under U.S. Pat. No. 2,791,289



Pictured is tunnel-testing equipment at Simpson's Seattle, Washington, laboratory. Simpson is the first building materials manufacturer to build its own fire test tunnel, a replica of the one used by U.S. Forest Products Laboratory. Pyro-Chem is the latest of a long line of dramatic new building products developed through Simpson's continuing research program.

Simpson

PCP

PYRO-CHEM PROTECTION

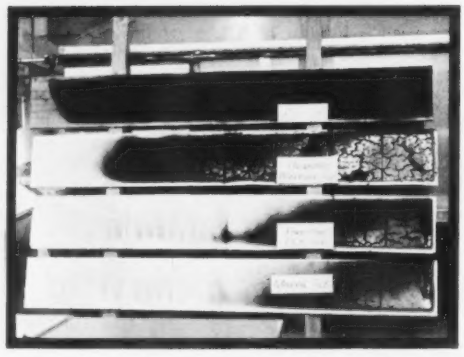
LOWEST COST TYPE I FLAME-SPREAD PROTECTION

For the first time it is possible to obtain maximum flame spread protection combined with the tremendous economies of woodfiber acoustical material.

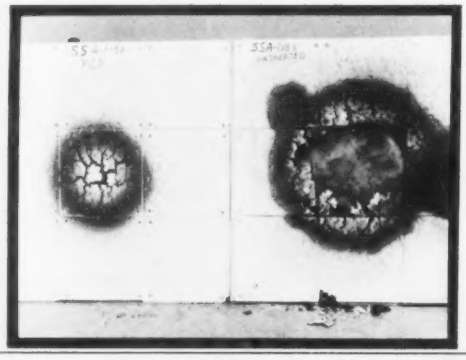
New Simpson PCP acoustical products may be used anywhere an **absolutely** incombustible ceiling is not required. This makes possible great savings in construction of schools, clinics, churches, stores, restaurants and similar buildings. Simpson PCP products were especially designed for those institutional, commercial and recreational facilities where a low flame-spread rating and effective sound control are necessary, but where cost savings are desired.

WOULD YOU LIKE A PYRO-CHEM DEMONSTRATION AND SAMPLES?

Your nearest Certified Simpson Acoustical Contractor will be glad to provide you with samples and arrange for a demonstration at your convenience. He is listed in the Yellow Pages under Acoustical Materials.



Typical sample panels (top) after testing in Simpson's tunnel test equipment.
Sample panels after testing (bottom) in accordance with Federal Specifications SSA-118b. Left: PCP tile after 40 minute test. Right: untreated woodfiber tile after only 20 minute test.



SIMPSON TIMBER COMPANY
2069 WASHINGTON BUILDING, SEATTLE 1, WASHINGTON

PYRO-CHEM protection sounds wonderful, but seeing is believing. Please arrange for me to see

☐ **SAMPLES** ☐ **DEMONSTRATION**

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103	116	129	203	216	229	303	316	329	342	355	368	381	394	407	420	433	446	459	472	485	498
104	117	130	204	217	230	304	317	330	343	356	369	382	395	408	421	434	447	460	473	486	499
105	118	131	205	218	231	305	318	331	344	357	370	383	396	409	422	435	448	461	474	487	500
106	119	132	206	219	232	306	319	332	345	358	371	384	397	410	423	436	449	462	475	488	501
107	120	133	207	220	233	307	320	333	346	359	372	385	398	411	424	437	450	463	476	489	502
108	121	134	208	221	234	308	321	334	347	360	373	386	399	412	425	438	451	464	477	490	503
109	122	135	209	222	235	309	322	335	348	361	374	387	400	413	426	439	452	465	478	491	504
110	123	136	210	223	236	310	323	336	349	362	375	388	401	414	427	440	453	466	479	492	505
111	124	137	211	224	237	311	324	337	350	363	376	389	402	415	428	441	454	467	480	493	506
112	125	138	212	225	238	312	325	338	351	364	377	390	403	416	429	442	455	468	481	494	507

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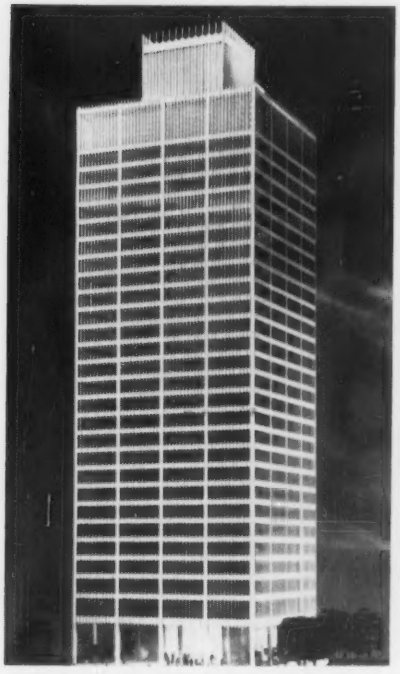

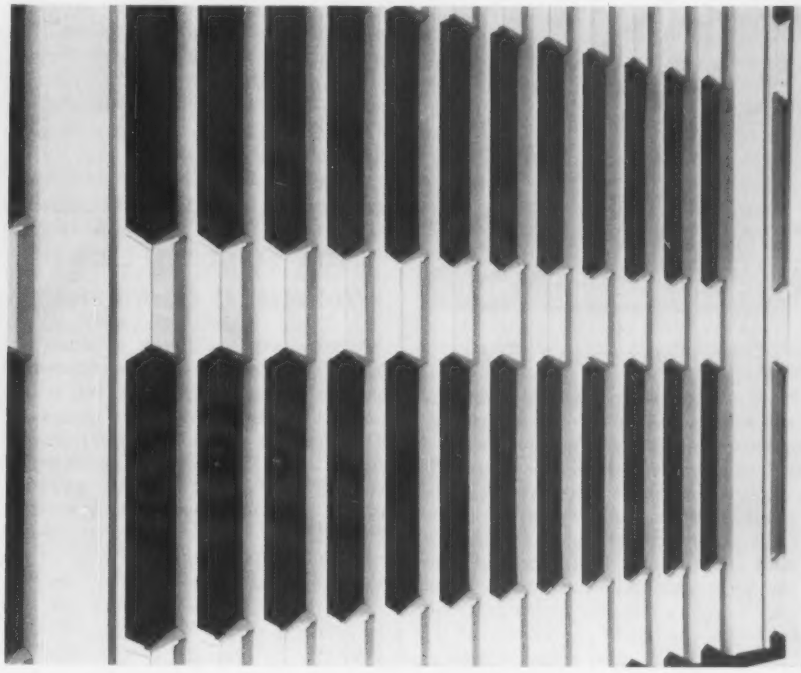

NEW STEEL PRODUCTS MARK DETROIT BUILDING

DETROIT, MICH. The Michigan Consolidated Gas Company Building, now under construction, is a showcase for two new steel products appropriate for discussion in this issue of P/A, devoted to "Tectonic Steels." Designed by Minoru Yamasaki & Associates with Smith, Hynchman & Grylls, the building has specially designed, stainless-steel windows and a floor system permitting utmost flexibility in mechanical and electrical services.

The building is using 4800 elongated, hexagon-shaped, stainless-steel windows (*above*) fabricated by Adams-Westlake Company from roll-formed sections produced by Van Huffel Tube Corporation using McLouth stainless. The sections, which impart great strength, will be welded at only two points, assuring fully leakproof protection. Type 302 stainless will prevent corrosion in place.

The building's Granco "A-E (air-electric) Floor" system consists of a secondary structural slab supported on adjustable steel pipe supports above a structural floor. An air plenum is provided to supply or return conditioned air, and wires for electrical circuits are carried by large capacity cells fed by conventional header ducts.

McLouth Steel Corp., 300 S. Livernois Ave., Detroit 17, Mich.

On Free Data Card, Circle **100**

Granco Steel Products Co., 6505 N. Broadway, St. Louis 15, Mo.

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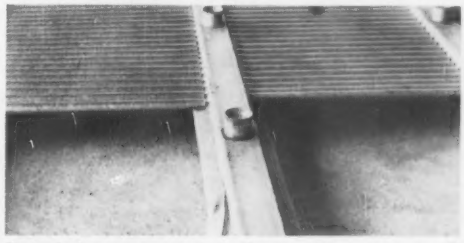
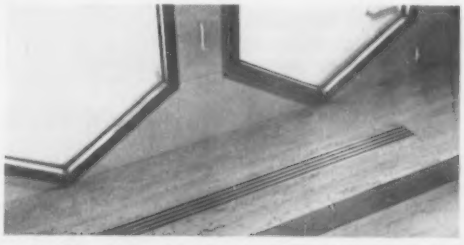
Construction photo shows A-E cells resting on steel pipe supports.



Detail shows corrugated plenum form and round, preset inserts of system.



A-E Floor permits flexibility in height of sill around perimeter.

Steel Swimming Pools

Steel panels, which can be installed in a variety of free-form shapes, obviate the need for expensive concrete constructions in swimming pools. The panels fit together with a "cellular" locking device that prevents them from moving after earth is filled behind them. Holes in the panels allow for plumbing and underwater lighting. The new panels permit construction of a pool in three working days. Cascade Pools Corporation, Talmadge, N. J.

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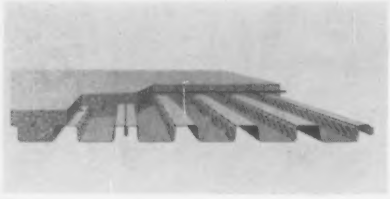

Deck Reinforces Slab, Is Also Permanent Form

New "Hi-Bond" steel floor deck provides concrete reinforcement without bars while also serving as a permanent form. Because separate bars, forms, and shoring are eliminated, and more economical gages of steel can be used, the new system compares favorably in cost with traditional methods of reinforced-concrete construction. At the same time, the manufacturer says, substantial savings are possible on the job because the steel decking goes in fast and acts as a working platform from the start.

The reinforcement strength of Hi-Bond deck is provided by raised lugs formed into the webs of the panels during the rolling process. These lugs serve the same purpose in the slab as do the deformations in regular steel reinforcing bars, providing a positive lateral and vertical mechanical bond between steel and concrete, causing the two to act as a unit in bearing loads and stresses. From beneath, the Hi-Bond lugs also make an excellent key for sprayed-on fireproofing. Hi-Bond will be available in most regular Inland deck profiles, and will also be offered as a cellular steel floor. Inland Steel Products Co., P. O. Box 393, Milwaukee 1, Wis.

On Free Data Card, Circle **103**

First Complete Line of Prefinished Components

Announcement is made of the first mass-produced line of pre-engineered steel building components for which no on-the-job painting is necessary. Stran-Steel introduced factory-applied color in 1958 with its color-coated roofing and siding panels; however, until now, windows and decorative parts have continued to be painted in the field. The manufacturer states that savings from the new development will be 300–400% over the cost of painting in the field during or after erection. In addition to these savings and speedier erection time, factory application of color attains new high standards of quality. On-the-job roof painting, for example, involves workers walking on previous coats. Also, any paint job applied outdoors picks up foreign matter while drying. Stran-Steel Corp., Div. of National Steel Corp., Detroit 29, Mich.

On Free Data Card, Circle **104**

Steel-Framed Seating for Chase Manhattan

Office seating designed especially for the new Chase Manhattan Bank building in New York (p. 50, JULY 1961 P/A) will be introduced into regular dealer line. Chairs have mirror-chrome finished steel frames with rounded, but not overstuffed, seats, backs, and armrests. Nine different models include four executive armchairs with posture backs and fixed backs, an executive fixed-back chair without arms, and a secretarial posture chair. All of these are swivel models with ball-bearing casters and adjustable seat heights of 16½″ to 21″. Non-swivel side chairs with and without panel arms are also available. Upholstery is in supported vinyl, plain weave and bouclé frieze weave fabrics. Royal Metal Manufacturing Co., 1 Park Ave., New York 16, N.Y.

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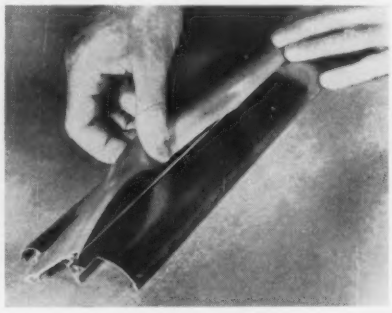

WEAR-RESISTANT THRESHOLD

A threshold of stainless steel has been made available to last the life of the house, to provide protection against drafts, and to be competitive in price with customary thresholds. Prenotched for door jamb and stop, it requires no cutting for standard door widths. A vinyl seal strip snaps into retaining channels and conceals all screws. United Industries, Inc., 231 South La Salle, Chicago, Ill., is the manufacturer.

On Free Data Card, Circle **106**

Zinc-Coated Steel Is Paintable, Weldable

Recently introduced was a spangle-free, paintable, zinc-coated steel designed specifically for better paintability and resistance spot welding characteristics. The hot-dipped, continuously coated sheet is said to be the first sheet chemically treated for painting to carry a 1.25 ounce class coating weight as specified by ASTM A-93. Wide versatility ranging from exterior curtain walls to interior shower stalls is claimed for the material. It is expected to challenge phos-

phate-treated, cold-rolled steel and aluminum in their markets. Armco Steel Corp., Curtis St., Middletown, Ohio.

On Free Data Card, Circle **107**

Varied Shapes Possible with Terne Roofing

Terne roofing, one of the late Frank Lloyd Wright's favorite materials, is seen here in two different applications. Terne is copper-bearing strip steel with a lead-tin alloy coating. The gymnasium of Willcox High School of Willcox, Arizona, by Scholer & Fuller, is covered by an externally ribbed, terne-roofed shell whose arclike lines are repeated horizontally by the curve of the entrance overhang. The terne is painted light to reflect a major amount of the Arizona sun.

A more customary application of terne is seen in the roofing of St. Andrew's Episcopal Church of Mayo, Maryland, designed by Rogers, Taliaferro, Kostritsky & Lamb. Here the material defines the pitches and sharp edges of the roof, making it the major element of the building composition. Follansbee Steel Corp., Follansbee, W.Va.

On Free Data Card, Circle **108**

Steel Windows in 19 Colors

New steel windows—horizontal sliding and single-hung vertical—are manufactured in 19 baked-enamel colors, permitting integration of windows into the over-all color scheme. The tubular-steel sash and frame of "Series 261" give excellent strength and rigidity, plus dead-air insulation that reduces heat loss and minimizes glass fogging. Optional features are glass-fiber screen panels, an interior casing for variable wall depths, inside glazing for multistory application, and integral insulating sash. A one-piece fin and interior casing that reduces installation time and eliminates need for plaster or dry-wall return is also available. Rusco Div., The F. C. Russel Co., Pandora, Ohio.

On Free Data Card, Circle **109**

Electric Traverse Curtain Rod

An anodized aluminum rod for traverse draperies is available that functions electrically by local or remote control. A single wall button opens or closes the coverings of single windows (or as many as six windows) up to a distance of 250 feet without the use of cords, cables, or chains. Multipoint controls will open draperies from two locations. All controls open or close coverings fully, or partially, to any desired position. Manufacturer: Kenny Manufacturing Co., Cranston 10, Rhode Island.

On Free Data Card, Circle **110**

Sculptural Pedestals

Occasional chairs and stools with a personal flair are among the recent designs by Vladimir Kagan. Two separate elements of cast aluminum comprise the "Unicorn" pedestal and V-shaped base of the molded seating pieces. A small desk in the collection is a rich combination of zebrawood (in the top and drop-leaf, which have matching graining) and walnut (in the mitered frame from which the drawer unit is suspended). Kagan-Dreyfuss, Inc., 40 East End Avenue, New York 28, N. Y.

On Free Data Card, Circle **111**

Byers Enters Steel Pipe Market

A. M. Byers Co., long known as the wrought-iron pipe people, has announced that it will market steel pipe on a national basis. Pipe will be available in a wide range of sizes, finishes, and weights in A53 and A120 pipe grades. A. M. Byers Co., 717 Liberty St., Pittsburgh 22, Pa.

On Free Data Card, Circle **112**

Tubular-Steel Posts

Post-and-beam construction — with a difference—frames the new campus-type Science Hill High School in Johnson City, Tenn. The difference is in the use of steel. Beams consist of 12″ "Junior Channels" butt-welded into box channels. Tubing 4″ square was used for the posts, mortised at the top to receive the beams. At the site, the posts were embedded in concrete piers, the box channels were slipped into the notch of the posts, and the connection was welded. Posts are spaced 7′4″ o.c., and because of the

strength of the box channels, a clear span of 28′-8″ is possible from post to post in the interior of the building. All load-bearing interior walls are eliminated. The one-story school was designed by Architect Leland K. Cardwell and the Appalachian Consulting Engineers. Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa.

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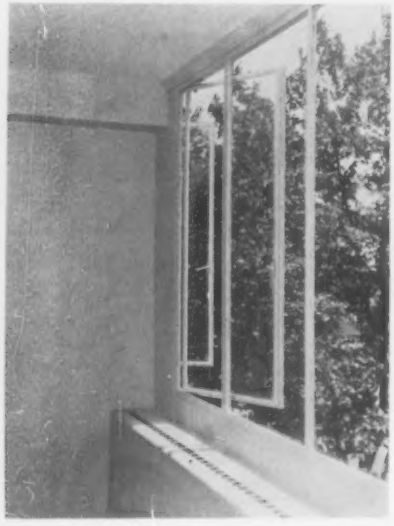
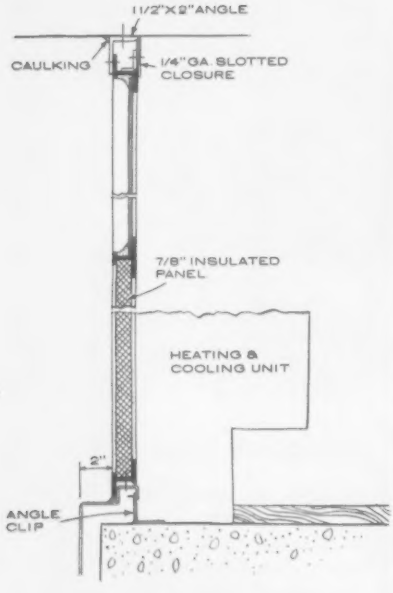




Galvanized-Steel Sash

Economical galvanized-steel sash are used in the new Weequahic Park Tower apartment building in Newark, N.J. With galvanized sash, painting is unnecessary, states the manufacturer; a low-cost, maintenance-free unit is assured. The windows are available in all standard Fenestra sizes. The building is sheathed with insulated, porcelain-enameled steel panels (also by Fenestra); for further economies, the inside surface of the panels forms the interior wall. The building is one of Newark's first fully air-conditioned apartment buildings, rents for $50 a room. Architect was Romolo Botelli, Jr. Fenestra, Inc., 11801 Mack Ave., Detroit 14, Mich.

On Free Data Card, Circle **114**

Design Possibilities with Colored Ceiling Tiles

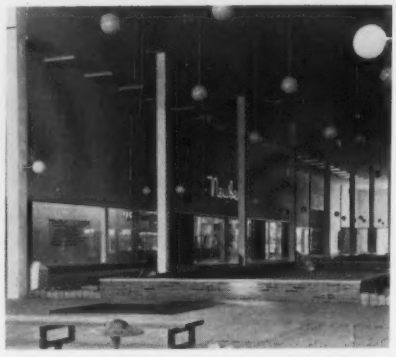
Varicolored and multidimensioned effects with acoustical ceiling tile are possible with "Multi-Plane" ceiling elements. Tiles come in 1″, 2″, 2½″, and 3″ thicknesses in choice of 23 colors. Standard tiles are 16″ x 16″, 20″ x 20″, 24″ x 24″, 24″ x 48″, and 30″ x 30″. Tiles are rabbeted to fit all standard suspension systems and require a minimum of space above the system for installation. Tectum Corp., Decorative Div., 535 E. Broad St., Columbus 15, Ohio.

On Free Data Card, Circle **115**

Light Dimmer Fits Standard Single Wallbox

The first full-range electronic incandescent light dimmer that fits into a standard single wallbox is now available. "Dreamliter 600" provides smooth, gradual control of lighting intensity all the way from full dark to full bright on incandescent circuits up to 600 watts. The dimmer is the size of an ordinary switch, installing like a standard two-way switch with the same two wires, the same single wallbox, and the same standard switch plate. Electro-Solid Controls, Inc., 8001 Bloomington Freeway, Minneapolis 20, Minn.

On Free Data Card, Circle **116**



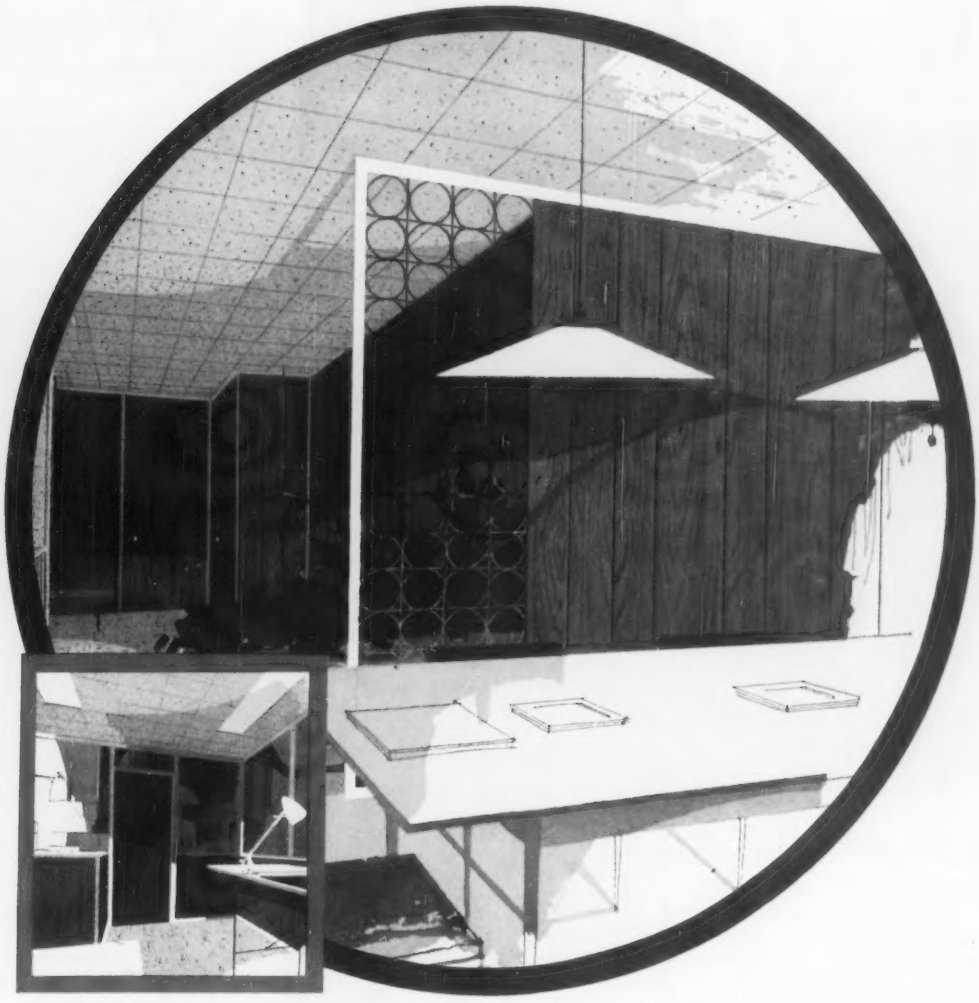
Steel Framing System for Shopping Center

A structural system engineered by Macomber, Inc., for the just-completed Great Lakes Mall shopping center in Mentor, Ohio, reduced fabricating time and cost. A four-square bay was produced by utilizing high-strength, open-web, interlocking framing to speed the erection of prime bay framing members: girders, purlins, and columns. Fabricating time was saved by using roof purlins with bearing ends welded to girders. After one line of angle bridging was welded to top and bottom chords at the centerline, long-length deck plates were nailed or welded over multiple spans, concentrating all welding operations at one time in the roof assembly. Standard bay sizes were used and divided by firewalls, further reducing fabricating time. At these locations, double framing was used so that walls could be laid up through the roof without any interference with the steel frame. This separation at regular intervals also eliminated expansion joints. Along outside walls a short column supported on a spandrel girder eliminated full-length columns down to the ground at midpoints in bays. These short columns were interlocked with purlins to the other side of the bay. Macomber, Inc., 1925 Tenth St., N.E., Canton, Ohio.

On Free Data Card, Circle **117**

Simpson

Commercial Easy-Wall partition system...



A PRODUCT OF IMAGINATION

New Commercial Easy-Wall frees **your** imagination from the bonds of traditional materials and methods. Not just ordinary partitions and panels, Simpson Easy-Wall is an ingenious and versatile **component system.** Handsome enough for Board Rooms, yet economical enough for plant offices, Easy-Wall saves up to $3 per lineal foot... is completely movable and reusable ...has excellent thermal and acoustical properties. **One crew installs** these handsome partitions, panels and matching doors... more quickly, more easily, with no muss or fuss. Try them in combination with famous Forestone® **sculptured** acoustical ceilings for beautiful and practical space planning.

● For samples and detailed file folder, call your Simpson Certified Acoustical Contractor (Look in the Yellow Pages under Acoustical Material) or write:

SIMPSON, ROOM 2060 WASHINGTON BUILDING, SEATTLE, WASHINGTON

RELY ON Simpson CERTIFIED ACOUSTICAL CONTRACTOR

S1A2A (6239)

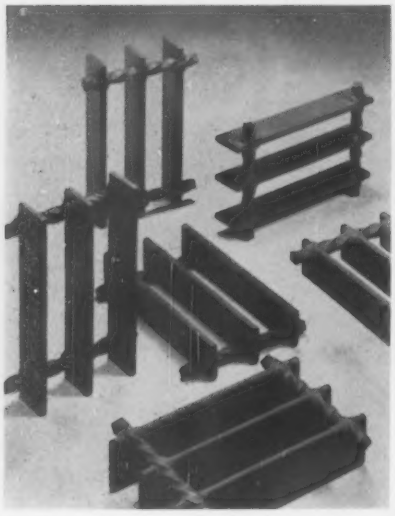
® U. S. PAT. NO. 2,791,289

For more information, turn to Reader Service card, circle No. 429

All-Nylon Upholstery

Schumacher's new line has a group of eight all-nylon upholstery fabrics designed for utmost durability. The group comprises: a heavy cable stitch texture with a latex backing, an interesting sticklike design, and a waffle weave texture. Each design has a range of colorways. F. Schumacher & Co., 535 Madison Ave., New York 22, N. Y.

On Free Data Card, Circle **118**



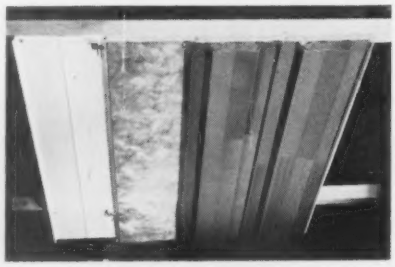
Ceramic-Coated Steel Grating

New type of ceramic coating fused to steel grating produces a "permanent maintenance-free installation which never requires painting." Weathering essentially has no effect on surface. In the event of mechanical damage breaking through the ceramic, oxidation is confined to the point of damage, with no lateral creep. Coating is resistant to most acid, alkali, and caustic exposures and will not wear through normal traffic. Grating can be welded and torch cut for openings without serious damage to the coating. The coating provides a matte-type finish for nonskid properties. Cost is said to be in the range of hot-dipped galvanized grating. Allied Material Supply Co., 300 Cedar Blvd., Pittsburgh 28, Pa.

On Free Data Card, Circle **119**

Curtain-Wall Panel Has Simplified Assembly

New insulated metal curtain-wall panel has a patented and simplified



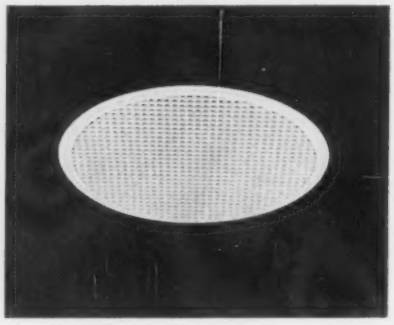
field assembly that drastically reduces erection time and provides an economical and durable wall. The completed assembly of the "EGSCO Type B Panel" consists of exterior and interior panels with 1″ glass-fiber insulation between. In the simple erection procedure, the back or interior panel is fastened to the structural-steel girts by self-tapping screws. A specially designed clip securely anchors interior panel, insulation, and exterior panel. The finished wall is unmarred by visible fasteners or horizontal joints. Exterior panels are of galvanized, aluminized, or stainless steel, or of aluminum. For protection of the panel surface until after erection, all panels are roller-coated with "Peelcote," a strippable vinyl skin. Elwin G. Smith & Co., Inc., Williams St., Pittsburgh 2, Pa.

On Free Data Card, Circle **120**

Apartment House Security System Uses TV

"Watchdog Television" was created to give apartment owners protection against intruders. When a visitor presses the apartment's buzzer in the lobby, the tenant can press a button and get a picture of the person in a 5″ TV screen before releasing the downstairs door. A house telephone above the screen permits two-way conversation. This screens out unwanted visitors who are able to disguise their voices over the usual annunciator systems. The image appears immediately, unlike the typical TV set, because the tube is kept partially warmed-up at all times. Installations are custom-designed. Bell Television, Inc., 552 W. 53 St., New York 19, N.Y.

On Free Data Card, Circle **121**



Louvered, Round Fixtures for Fluorescent Lighting

New louvered, round, fluorescent recessed fixture is available in diameters of 2′, 3′, and 4′, features "low brightness with warmth of design." Round units are equipped with "Scallop-Cel," small-cell aluminum louver with vinyl plastic laminated to the top for complete shielding of lamps from all viewing angles. Neo-Ray Products, Inc., 315 E. 22 St., New York 10, N.Y.

On Free Data Card, Circle **122**

Automatic Air Curtain Used on Industrial Doorways

"Air Isolator," an air-curtain closure, is installed directly over a doorway and begins operating automatically as soon as the door is opened. Air curtain forms a shield between outside and inside air, repelling heat or cold, dust and drafts in periods of heavy traffic when the door must be left open. Air from the inside area is drawn into the unit by a fan and forced at high velocity down across the entire width of the door. A patented dual adjustable throat allows adjustment of velocity and direction of the air to suit the individual doorway. Jamison Cold Storage Door Co., Hagerstown, Md.

On Free Data Card, Circle **123**

NEWS from Dow Corning

Stronger, drier walls

Tests prove that Silaneal improves bond, reduces water penetration through joints

Hold a brick in your hand. Feel it; heft it. It's heavy, solid, *strong.* But how strong a wall can you build with it? That depends, of course, on the bond between the brick and its brothers. Here is where Silaneal® makes the difference.

This plant-applied sodium siliconate treatment makes brick water repellent. Water absorption of the brick is controlled allowing mortar to cure properly. The bond at each brick-mortar interface is improved making stronger, more moisture-resistant walls.

Here's proof. The picture at left shows one of more than 100 test walls constructed under SCPRF-prescribed conditions to determine the effects of Silaneal on structural strength. Plastic bag (arrow) applied uniform transverse pressure to determine failure point. Result: Silaneal treated high absorption brick showed definite improvement in wall strength over similar but untreated brick.

Rain is mastered, too. Tests, simulating wind-driven rain, have shown repeatedly: No leakage through wall panels built of high suction brick treated with Silaneal; severe leakage at mortar-brick interfaces when using untreated brick.

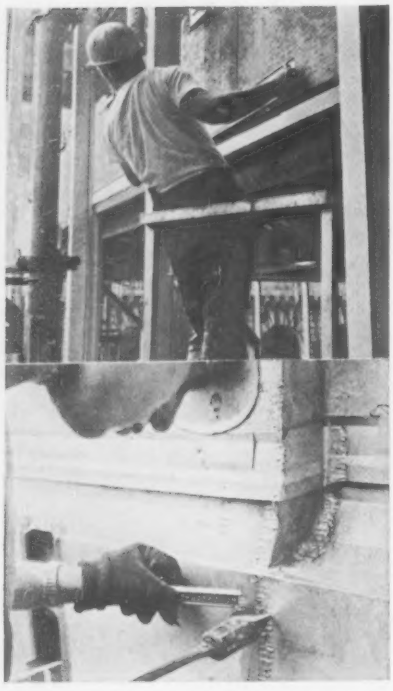
And brick stays clean. Soot and other airborne dirt that fall on high absorption brick are pulled into the brick with the first rain. Silaneal makes the surface of the brick water repellent and dirt is *washed away* with rain. And because water can't get into brick treated with Silaneal, efflorescence is minimized.

If you want more data on these tests or more information on Silaneal including a list of manufacturers offering Silaneal treated brick, write Dow Corning Corporation, Midland, Michigan, Dept. 6821.

SILANEAL®
keeps brick clean

Dow Corning CORPORATION
MIDLAND, MICHIGAN

STEEL DATA



Stainless-Steel Flashing

Technical Information on Stainless Steel Flashings provides details, samples, photographs, and specifications in a 4-page folder. Representative wall-flashing details are from three recent notable buildings; photographs illustrate ease of handling long strips and performing routine soldering operations on a typical spandrel-flashing installation. The unique advantages of stainless steel as a flashing metal for all building applications are presented briefly. Folder also describes the new "ColorRold" stainless steel, which has received thorough tests and is available in 11 durable coatings. Washington Steel Corp., Washington, Pa.

On Free Data Card, Circle **200**

Newly Adopted Spec on High-Strength Joists

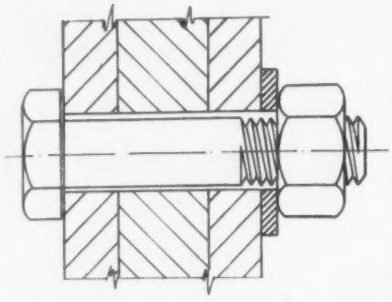
Specification for High-Strength Joists, 8 pages, has been published, having been adopted by the Cold Rollformed Structural Framing Institute in January, 1961. The term "high-strength joists" refers to open-web, load-carrying steel members suitable for the direct support of floor slabs and roof decks between walls, beams, and/or structural trusses, and utilizing high-strength cold-rollformed sections as top and bottom chord members. Several advantages of cold-rollforming are listed: higher yield and ultimate strengths, removal of rust and scale, and efficient design. The specification sections are under the headings of scope, definition, materials, design, application, quality control, handling and erection. Commentary on the specification gives further information on each of these aspects. Cold Rollformed Structural Framing Institute, P.O. Box 830, Canton 1, Ohio.

On Free Data Card, Circle **201**

New Lightweight Beams

Announcement of 11 new lighter-weight WF beams is made in 10-page booklet of tables. Seven of the sections are new lighter weights for WF beams currently produced; these average 8 to 11% less weight per ft than the present lightest weights. The other four sections are new light beams increasing Bethlehem's BL series to 14" and 16" nominal depths. Data includes theoretical dimensions and properties for designing, plus approximate dimensions for detailing. Tables are detachable for insertion in larger catalog of structural shapes. Bethlehem Steel Co., Bethlehem, Pa.

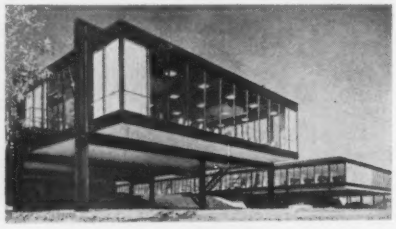
On Free Data Card, Circle **202**



High-Strength Bolts for Connecting Steel

"High-strength bolts have become the preferred method for connecting structural steel. They have provided strong joints, better connections, and have simplified installation." Thus states the new reference bulletin, *How to Use and Specify the New High-Strength Bolts,* which covers every facet of this development in fabricated structural joints. The 8-page, illustrated manual contains design theory, specifications, documented cost and product studies, and complete dimensional data on high-strength bolts, nuts, and washers. A special specification section highlights the latest ASTM specification for A325 bolts, with data on bolt sizes, installation techniques, and design considerations for thin sections. Russell, Burdsall & Ward Bolt and Nut Co., 110 Midland Ave., Port Chester, N.Y.

On Free Data Card, Circle **203**



Welded Connections

New manual, *Design of Welded Structural Connections,* gives a summary of fundamentals and current practices in welded connections for all types of structures. The 92-page text briefly covers the arc welding process, the weldability of steels, distortion, erection, welding to existing structures, and inspection; it also treats the design of connections for buildings and bridges using the elastic and plastic theories. The information is presented in numbered paragraphs for easy reference. A bibliography is included, as are numerous illustrations. Authors of the book are Omer W. Blodgett, Design Consultant of Cleveland, and Dr. John B. Scalzi, Associate Professor at Case Institute of Technology. Write (enclosing $1.00 in U.S.A.; $1.50 elsewhere) to: The James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio.

Complete Catalog on Metal Framing Systems

General Engineering Catalog No. 5, 178 pages, presents all necessary data on Unistrut systems for the construction of partitions, racks, supports for mechanical and electrical equipment, etc. Data pages show each of the channel combinations, nuts, clamps, fittings, and brackets that make possible these various metal-framed constructions. Dimensions, weights, and loads are indicated for each item. Unistrut Products Co., 933 W. Washington Blvd., Chicago 7, Ill.

On Free Data Card, Circle **204**

Condensed Data on Steel Products

New 8-page catalog gives pertinent information—details, specifications, and load tables—on Shlagro's full line of

steel products. The firm, which pioneered the use of structural square columns, manufactures a wide variety of stock steel products, including the "Triangular Girder;" "Karri-More" beams, girders, and square columns; and vertical-member, long-span joists. The condensed catalog contains illustrations of all products, and describes their characteristics, economy, and use. Shlagro Steel Products Corp., 84 Washington St., Somerville 43, Mass.

On Free Data Card, Circle 205

Sloped Beam Gives Design Latitude

Folder, 4 pages, gives load tables and specifications for "Varco Slope Beam" system. The Slope Beam is a welded section with one horizontal flange and one tapered flange, and is fabricated of A36 steel having a yield point of 36,000 psi. It is widely adaptable as the key member of various roof-framing designs: it can be used to construct a low-pitch gable; it can be inverted for a flat roof; it can be tilted for natural drainage; it can be used in multiples for large structures. Decking and wall construction can be of any material. There is a wide selection of these pre-engineered building components; economies are significant. R. G. Varner Steel Products, Inc., P.O. Box 781, Pine Bluff, Ark.

On Free Data Card, Circle 206

Diamond-Shaped Openings in Long-Span Beam

Folder, 6 pages, describes the "Diamond Span-R Beam." The Span-R is a long-span beam, much lighter and stronger than the rolled section from which it is produced. Its use substantially cuts both erection time and final costs, compared with conventional

steel framing. In addition, the unique diamond-shaped openings permit virtually unlimited flexibility for the passage of pipes, ducts, and conduits, allowing for unobstructed maximum ceiling heights. The Span-R beam is readily adaptable for all types of framing or bracing, including cantilever construction, and can be used for clear spans up to 100′. The wide top and bottom flanges give unusual lateral stability, adding over-all rigidity to the structure. Folder shows typical connections, gives specifications, properties, and dimensions. Elizabeth Iron Works, Inc., P.O. Box 360, Elizabeth, N.J.

On Free Data Card, Circle 207

Joist Specifications

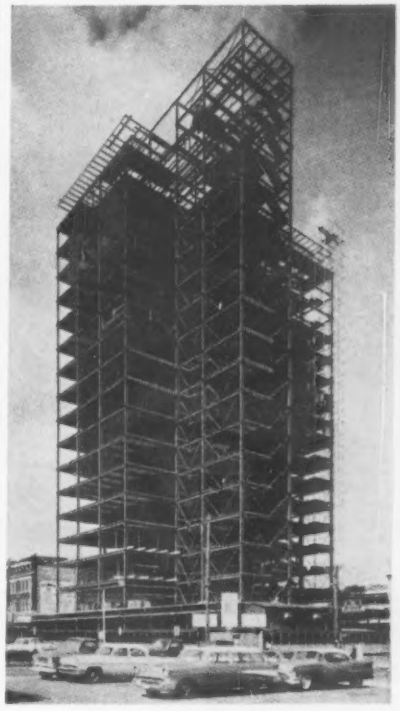
Open-Web Steel Joists, 1961 Edition, contains 36 pages of general information on steel joists and on the association composed of joist manufacturers. The organization and services of the Steel Joist Institute are described in the opening pages; advantages and descriptions of steel joists follow. Standard specifications and load tables comprise the main body of the booklet. Also provided is a list of manufacturers whose "S" series and "L" series joists have been checked and approved by the Institute. Steel Joist Institute, DuPont Circle Building, 1346 Connecticut Ave., N.W., Washington 6, D.C.

On Free Data Card, Circle 208

Hollow Structural Tubing

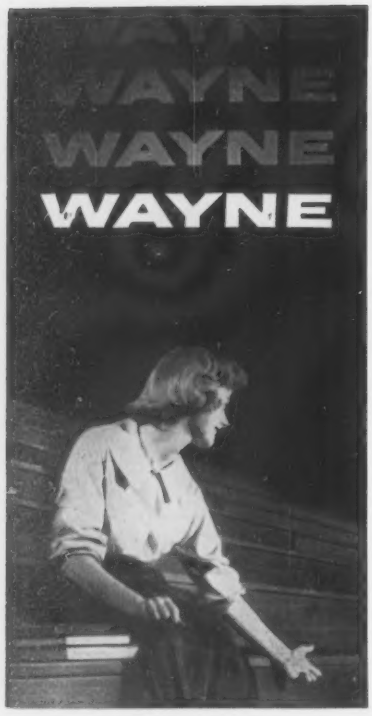
"The shape for things to come," states new 6-page folder, is hollow structural tubing. Among the advantages of the square and rectangular tubing are its resistance to stresses from any direction, its inherent material strength, its ease of connection to other structural shapes, and its availability in structural-steel grades. Because of the hollow design, there is maximum strength with minimum weight. Tubular members are highly efficient structurally, especially in compression and where subjected to bending movements in more than one direction. Folder gives tables and charts of properties. Hollow structural tubing is avail ble in a wide range of stock sizes: 1″ x 1″ to 10″ x 10″ for squares, up to 32″ perimeter for rectangles, and in lengths up to 42′. National Tube Division, United States Steel Corp., 525 William Penn Place, Pittsburgh 30, Pa.

On Free Data Card, Circle 209



The Proven Economies of Steel Framing

Save with Steel in Multistory Buildings, 48 pages, documents 15 actual examples where "careful cost analysis proved the economy of steel construction." The choice of structural framing involves more than a rule of thumb, states the booklet, and should include such factors as early occupancy, interest on construction loan, lower foundation costs, electrical flexibility, usable floor space, large column-free areas, and ease of future alterations. Data sheets and typical framing plans are presented for each of the 15



WAYNE INDOOR SEATING SYSTEMS

work wonders on any school budget

Durable Wayne Model 30 folding bleacher. Economy seating in the folding bleacher class.

Leader in luxury seating at a popular price. Wayne Model 50 Rolling Gymstand.

Deluxe Model 70 continuous rolling gymstand. Finest money can buy!

NEW CATALOG

Only Wayne offers three basic types! More value, better engineering, finer performance in each . . . from the world's largest manufacturer of spectator seating. Write for big, all new 1961 catalog today.

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For more information, circle No. 421

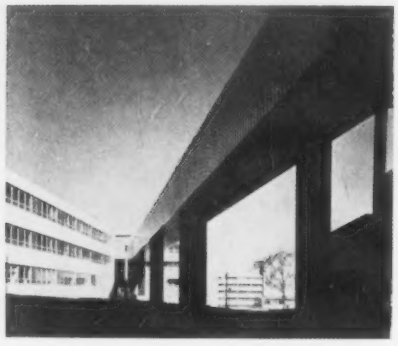
buildings. American Institute of Steel Construction, Inc., 101 Park Ave., New York 17, N.Y.

On Free Data Card, Circle **210**

Structural Applications of Wire Rope

New 32-page booklet, *Wire Rope for Structural Uses,* focuses attention on the growing applications for wire rope and bridge strand as structural materials. Applications illustrated and described include the suspended roof of the Pan American Terminal at Idlewild; the cable-supported cantilevers of Raytheon's flight-test facilities at Bedford, Mass.; and the circular roof of the San Antonio Assembly. Other structural applications discussed are suspension bridges, ski lifts, guys for transmission towers. Bethlehem Steel Co., Bethlehem, Pa.

On Free Data Card, Circle **211**



Steel Floors, Deck, Walls, Doors

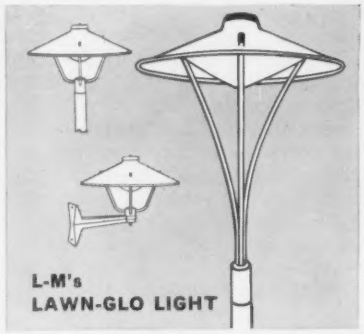
All-inclusive catalog presents extensive data on steel building products. Five separate catalogs, each 16 pages, discuss insulated metal curtain walls; rolling steel doors; "M-Floors" and "Cel-beam" sections for electrified subfloor construction; long-span "M-Decks" (which eliminate roof beams and purlins); and steel deck for roofs, sidewalls, partitions, ceilings, and floors. Construction details, installation photos, property tables, and specs are provided throughout. The R. C. Mahon Co., 6565 East 8 Mile Road, Detroit 34, Mich.

On Free Data Card, Circle **212**

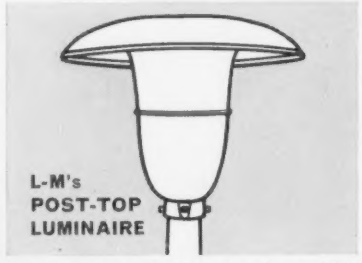
Welded Tubing Reference

Handbook of Welded Steel Tubing, 300 pages, is the official technical refer-

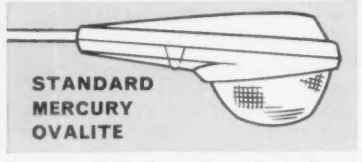
Continued on page 116



Three styles, for driveways, terraces, walks, parks—wherever soft, efficient low-level lighting is desired. All-aluminum weatherproof design with utility outlet; simple; efficient; quality lighting up to 150 watts incandescent. Six decorator colors and brushed aluminum.



—is an optically efficient, extremely adaptable unit for street lighting, parks, playgrounds, motels, pools, parking areas. Makes conversion extremely simple and economical. Choice of seven IES light patterns; six decorator colors or brushed aluminum; mercury, with ballast; or incandescent; photocontrol if desired.



luminaire, with built-in ballast; highly efficient for street and highway lighting; many convenience and safety features. Ask for bulletin.

In two and four light single, double units, for area, ramp, street, and underpass lighting. Also available with L-M's exclusive Peltier thermo-electric cooling for highest efficiency.

L-M SUBURBANAIRE

Designed for neighborhood streets, suburban and rural areas. In incandescent or mercury, with open type borosilicate glass refractor in choice of light patterns.

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

525

Outdoor Lighting

For more information, circle No. 337

ADDED BEAUTY FOR LOCATIONS like this. The Styled Mercury unit directs the light downwards and eliminates glare. It illuminates 11,000 square feet to 3 footcandles. You need fewer and shorter poles, and less wiring, to get the desired level of light.

ANOTHER IN THE FAMILY of modern Styled Mercury luminaires. The entire line is all-aluminum, with Holophane® refractor. Choice of 1000, 700 or 400 watt ratings. Available in choice of brushed aluminum finish or five decorator colors.

FOUR OF THE LATEST design units provide excellent nighttime illumination for traffic and pedestrians on this busy street in a shopping section.

L-M Announces Another Graceful Design In The New Styled Mercury Light Family

Line Material's Styled Mercury luminaires are a family of high quality, high intensity lighting units. The latest addition to the Styled Mercury line is the upsweep design installed in the well-lighted street shown above.

These are large, handsome luminaires, styled for Line Material by a noted industrial designer. They will contribute daytime beauty and excellent nighttime lighting to any street, park, mall, public square, or parking area.

Line Material is a leading manufacturer of outdoor lighting designed specifically for the application. L-M also provides competent Lighting Application Service by experienced lighting engineers, available through Authorized L-M Distributors.

GET COMPLETE INFORMATION

Ask your Authorized L-M Distributor for bulletins, or mail the coupon.

OUR 50TH YEAR
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LINE MATERIAL® Industries
McGRAW-EDISON COMPANY
Outdoor Lighting

McGRAW EDISON

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DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES
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Line Material Industries, Milwaukee 1, Wisconsin
Please send me details on L-M Styled Mercury family of luminaires, and name of nearest distributor. PA-91

Name_____
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Type of Area To Be Lighted_____

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Enhance the beauty of REDWOOD

inside . . .

House in Los Altos, Calif.
Architect: Bolton, White and Jack Herman, San Francisco
Paneling and woodwork finished with Cabot's Stain Wax.

outside . . .

Redwood siding and trim stained with Cabot's Creosote Stain.

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Finishes for

REDWOOD

Architects and builders know that Cabot produces the ideal finishes for Redwood. • Easy to apply and economical • Accent the texture and grain

For exteriors:

Your choice of finishes — clear, natural, gloss, driftwood or stains in 35 distinctive colors.

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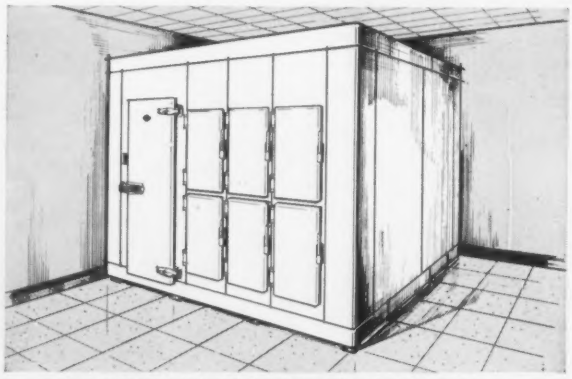
Stain, wax and seal in one easy operation with Cabot's Stain Wax

SAMUEL CABOT INC. 928 S. Terminal Trust Bldg., Boston 10, Mass.

Please send your "Redwood Staining" Brochure

For more information, turn to Reader Service card, circle No. 332



Installation in Hotel Quito, Quito, Ecuador, South America. Specifications prepared by Arthur Dana, Food Operations Consultant, 11 E. 44th St., New York, N.Y.

Bally pre-fab walk-ins

all-metal coolers and freezers

Sectional construction! Expandable any time! Costs less than built-ins!*

Newest concept in refrigeration storage makes construction of "built-ins" on the job obsolete. Precision made pre-fab sections permit installation anywhere, any size, any shape. Easy to increase in size or disassemble for relocation. Aluminum or galvanized steel are standard finishes. Stainless Steel and acid-resistant Porcelain also available. All finishes remain sanitary . . . odor-free . . . rodent and vermin proof.

Free architect's fact file...

Includes guide for specification writers . . . 16-page Walk-In book . . . portfolio of 48 installation drawings and specifications. Also included is a Walk-In description form to request plans and specifications from Bally engineers for individual installations. **Write on your company letterhead to Department PA.**

See Sweet's File section 26a/Ba.

*Based on cost scales in Metropolitan areas.

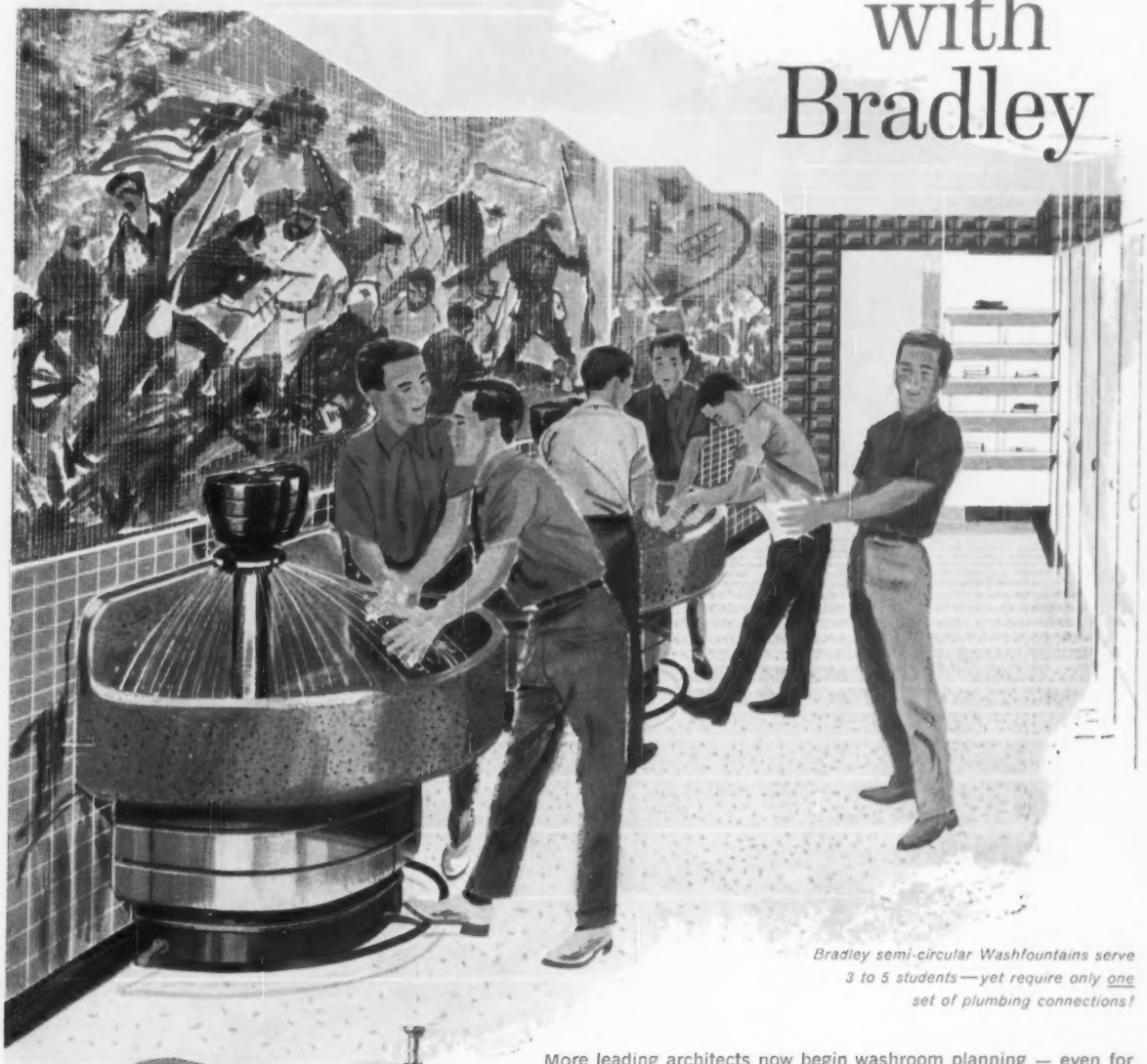
Bally

Bally Case and Cooler, Inc.
Bally, Pennsylvania

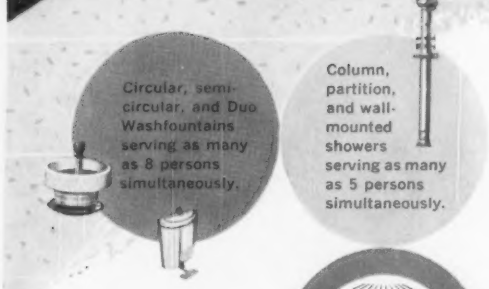
For more information, turn to Reader Service card, circle No. 327

try a fresh approach to washroom planning...

Begin with Bradley



Bradley semi-circular Washfountains serve 3 to 5 students—yet require only one set of plumbing connections!


Circular, semi-circular, and Duo Washfountains serving as many as 8 persons simultaneously.
Column, partition, and wall-mounted showers serving as many as 5 persons simultaneously.

More leading architects now begin washroom planning — even for narrow rooms — with Bradleys as their nucleus. Washfountains provide a kaleidoscope of colors, shapes, textures, and sizes — allowing far more freedom for original expression than ordinary basins.

Bradley Washfountains speed washroom traffic flow... end disease transmission with foot operation . . . and pinch pennies like a Scrooge, saving installation costs, water, space, and maintenance man-hours. But to gain these advantages you must include them in your preliminary planning. Draw the circle first—Begin with Bradley!

Bradley Washfountains and Showers provide group facilities for as many as 8 and 5 persons, respectively, in schools and in commercial, industrial, and public buildings everywhere. Your Bradley representative will gladly supply additional facts and assist on specific applications. Or write for latest full-color catalog No. 6004 to: Bradley Washfountain Co., 2277 W. Michigan St., Milwaukee 1, Wis.

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Continued from page 112

ence book of the industry. Published by the 30-year-old association of 18 leading manufacturers of tubes, it contains the latest engineering, design, and application data on welded carbon and stainless - steel tubing. According to the Welded Steel Tube Institute, the data will simplify the work of architects, designers, engineers, and fabricators of all types of tubular products. Included for the first time in the new handbook is an illustrated chapter on joining methods — both welded and mechanical—for welded steel tubing. The handbook also contains 48 pages of tables and design data, and a 27-page glossary of terms. Write (enclosing $10.00) to: Welded Steel Tube Institute, Inc., 1604 Hanna Building, Cleveland 15, Ohio.

Open-Web Joist Systems

1961 catalog, 28 pages, covers open-web steel joists, corrugated centering, and formed roof deck. Charts give properties and dimensions for Ceco's "S" series and "L" series joists; detailed isometric drawings show the types of bridging, anchoring, and accessories used in joist construction. The catalog also describes how electro-channel steel joists are used for electrified floor construction. Specifications and recommended field practices are provided for all joist systems. Companion literature gives load tables. Ceco Steel Products Corp., Dept. A, 5601 W. 26 St., Chicago 50, Ill.

On Free Data Card, Circle 213

Revised Design Manual on Cold-Formed Steel

Revised edition of *Light Gage Cold-Formed Steel Design Manual*, 140 pages, is now available. Included is the 1960 edition of the "Specification for the Design of Light Gage Cold-Formed Steel Structural Members," recognized as the official standard for the design of structural members formed from sheet and strip steels and intended for use in building construction. Supplementary information — illustrative examples and property tables — has been considerably expanded, to conform with the new technical developments reflected in the 1960 specification, and to simplify the application of the specification to design. Additional literature, the 60-page *Commentary*, is useful for its brief but coherent description of the reasoning behind the various provisions of the specification. Write (enclosing $1.00 for the manual, $.50 for the commentary) to: American Iron and Steel Institute, 150 E. 42 St., New York 17, N.Y.

AIR/TEMPERATURE

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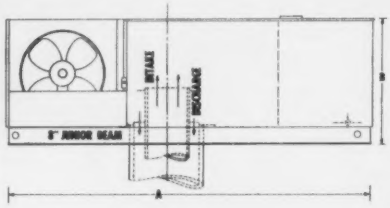
"Melco Roof - Top" units for heating and cooling single-story buildings are described in new 24-page brochure. By utilizing available roof space for heating and/or cooling, valuable floor space is saved—boiler room and compressor room are eliminated. Further, with a multiple system (each unit installed directly above the area to be conditioned), horizontal ducts can be eliminated and area zoning is possible. Brochure gives specifications and application data. Dept. PR, Melchior, Armstrong, Dessau Inc., Ridgefield N.J.



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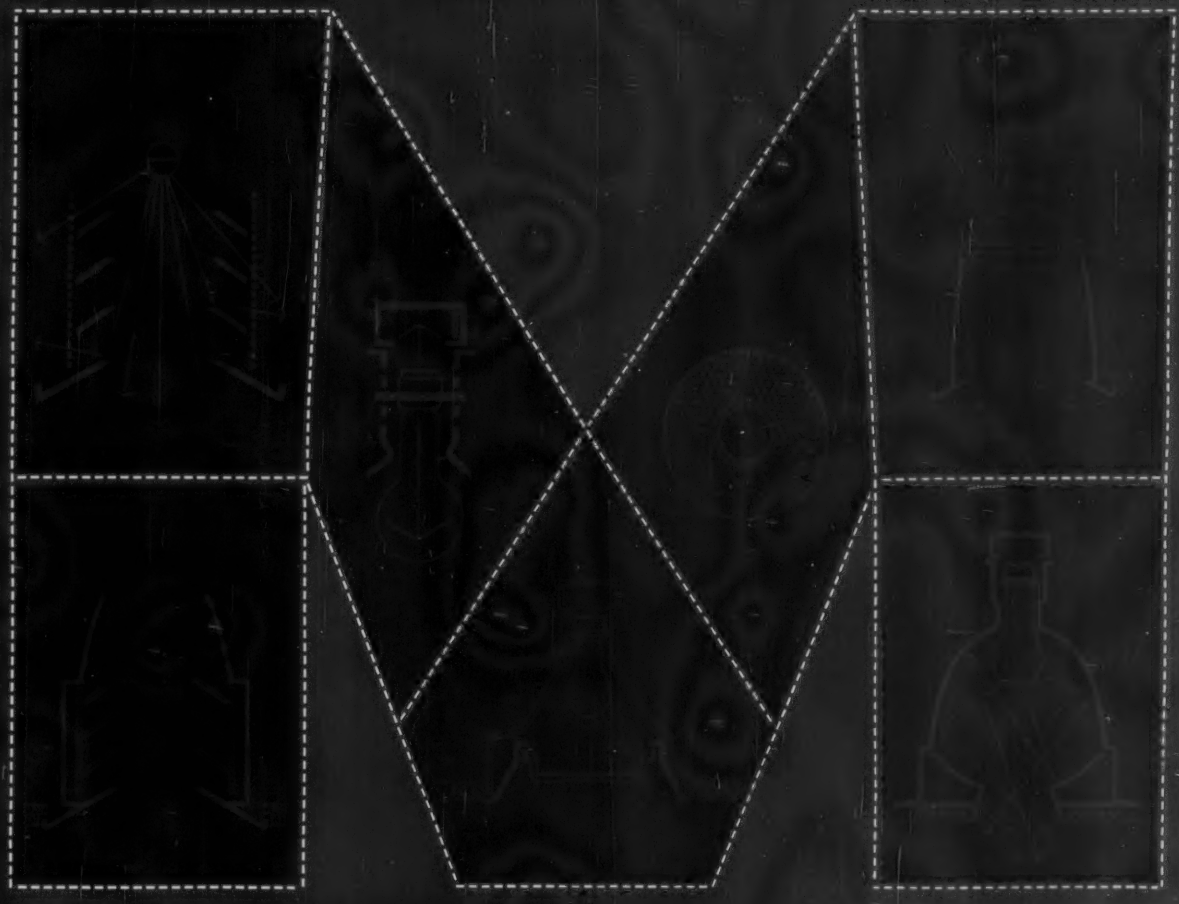
CONSTRUCTION

Watertight Masonry

The Design and Specification of Watertight Masonry, 6 pages, outlines considerations for tight masonry-wall design. The role played by "Omicron Mortarproofing" in providing a cohesive plastic mortar to aid top workmanship, and its positive water reduction to minimize shrinkage and cracking, are described in the bulletin. Also discussed are mortar ingredients and proportioning, compatibility of brick and

Continued on page 119



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"We saved in many ways," says Mr. Roy Schoenbrod, the architect. "Designed and bid both for steel and for concrete, the steel bid proved to be decidedly less expensive. What's more, during construction we observed that steel construction made the job easier for the pipe trades such as heating, air-conditioning, conduits and plumbing. Work went faster and labor costs were reduced considerably. This was our first experience with steel on a building of this size, but now that we've seen what it can do, we'll think of steel first from now on."

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. . . savings readily apparent when steel bids are compared with material other than steel. What's more such savings accrue regardless of size of building—from horizontally structured apartment houses or hospitals to vertically-reaching hotels or office buildings. Earlier occupancy, interest savings on construction loans, lower labor costs, all contribute to make steel by far your best actual and potential value for every construction dollar.

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Continued from page 116

mortar, control of shrinkage and bleeding, separation cracks, effect of mechanical disturbance, and importance of proper protection. The Master Builders Co., Div. of American-Marietta Co., 2490 Lee Blvd., Cleveland 18, Ohio.

On Free Data Card, Circle 215

How Does Your Garden Grow?

Imaginative ideas for outdoor living are attractively presented in the new *Garden Redwood Ideas from California*, 16 pages. Fences, shelters, benches, decks—even a gazebo and a teahouse—are shown in photos; a few details for railing, decking, post-and-beam construction are interspersed among the photos. Designs are the work of noted landscape architects. California Redwood Assn., 576 Sacramento St., San Francisco 11, Calif.

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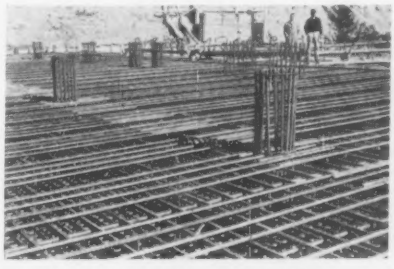

High-Strength Bars

Cost-saving advantages of high-strength reinforcing bars are discussed in 6-page folder. The booklet

Continued on page 122

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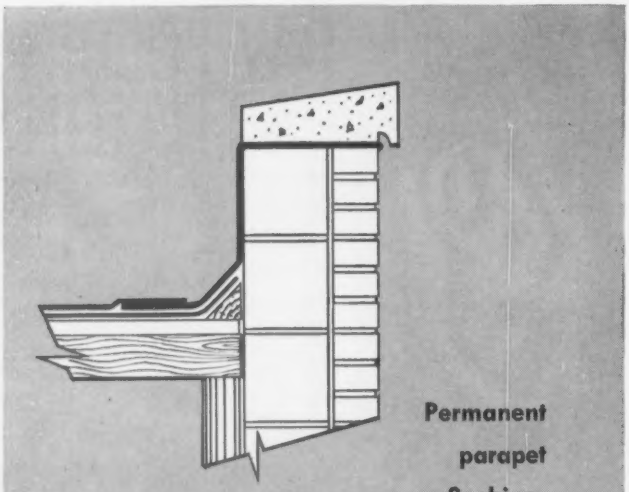
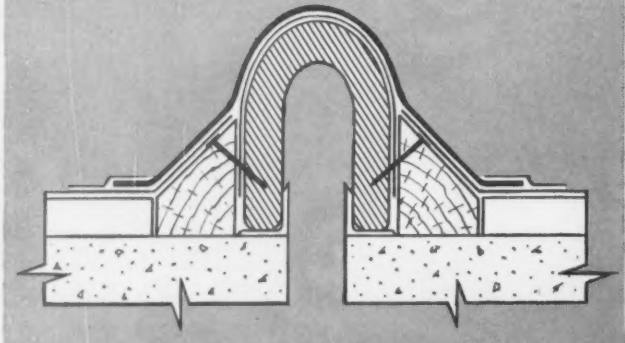
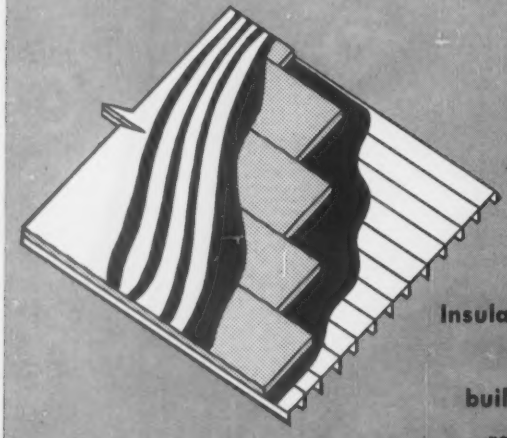


Permanent parapet flashing.



Insulated expansion joint.



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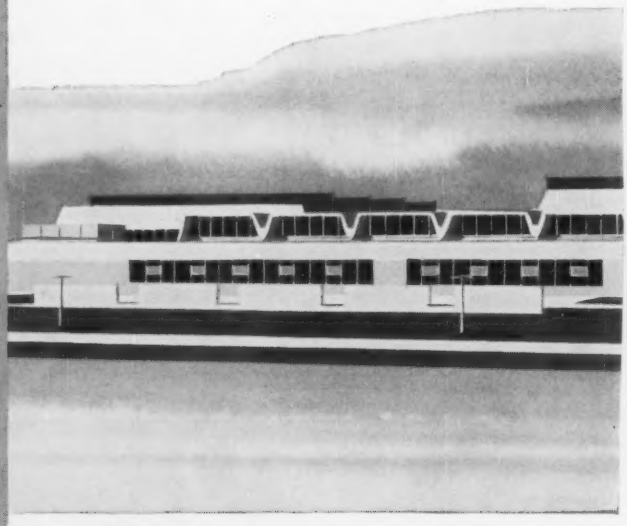

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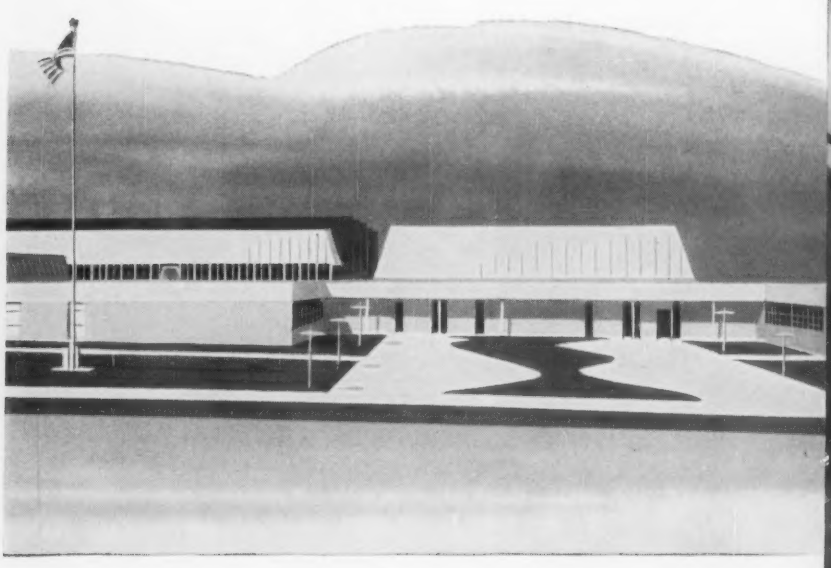

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Continued from page 119

states that high-strength bars can reduce the amount of steel by as much as one third in columns, foundations, and other applications. High-strength reinforcement also helps to lower labor costs, and provides high design stresses for stronger structures and greater safety. Basic technical data, and illustrations of recent installations, are given. Advertising Div., Republic Steel Corp., 1441 Republic Building, Cleveland 1, Ohio.

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Reference Papers on Brick and Tile

Recent editions of *Technical Notes on Brick and Tile Construction*, each 4 pages, discuss "SCR Acoustile" (for Structural Clay Research—the trademark of the Structural Clay Products Research Foundation), heat-transmission coefficients of brick and tile walls, and radiation protection with clay masonry. Another important reference folder is a glossary of terms relating to structural clay products. These papers are published monthly. Structural Clay Products Institute, 1520 Eighteenth St., N.W., Washington 6, D.C.

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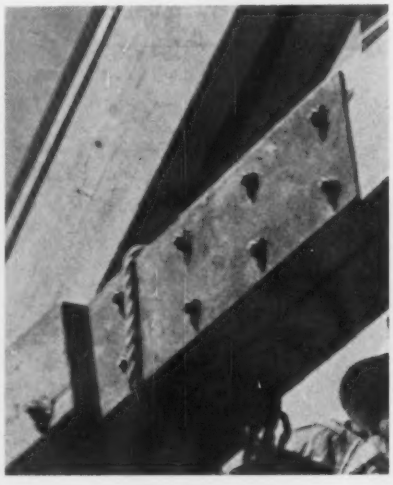

Connectors for Wood-Frame Construction

New 12-page catalog describes Teco's complete line of timber connectors, framing devices, and installation tools. In addition to detailing many standard and widely used products, the publication also provides information on several new products — post caps for framing 4 x 4 posts to 4 x 4 or 4 x 6 beams; angles for special framing

Continued on page 126

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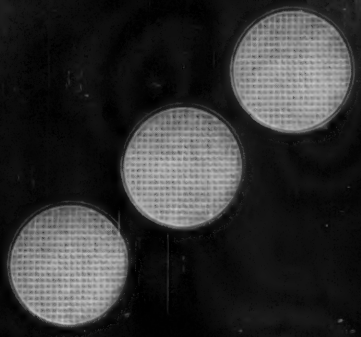

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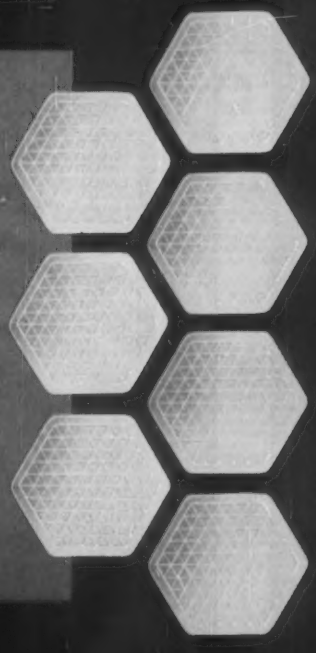

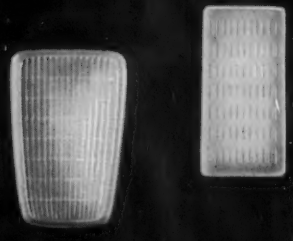

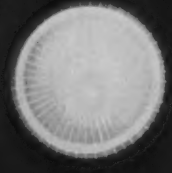

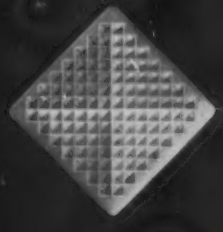

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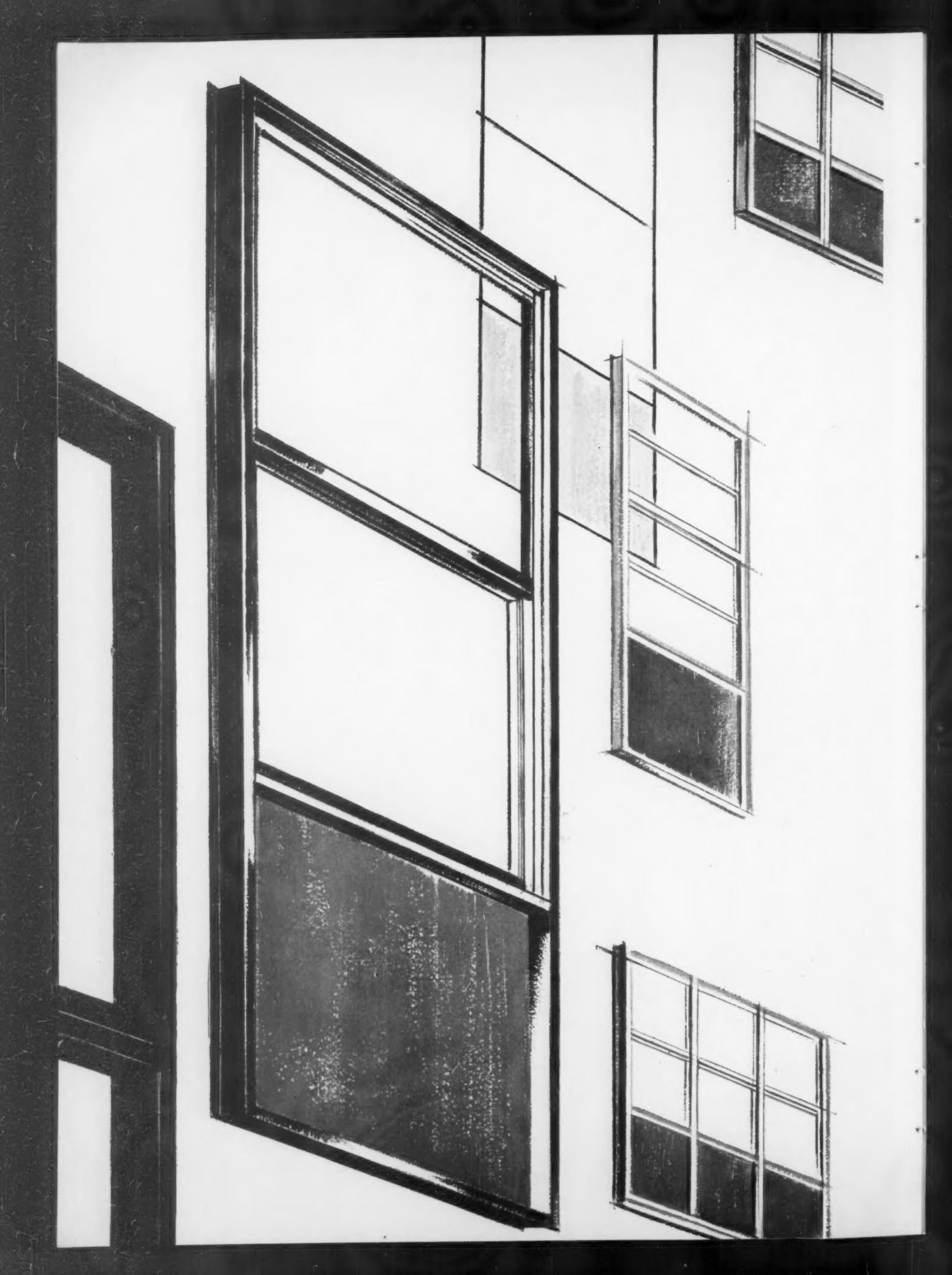

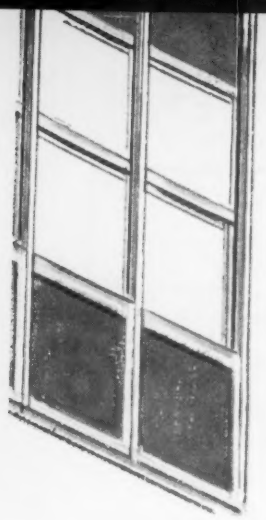

New...from CECO

Aluminum windows and curtainwalls

with double-hung, single-hung or fixed windows

At last, here's a curtainwall that permits imaginative building design—enabling the architect to create a "character unto itself" for each building. And the components are of heavier-than-average aluminum, of custom manufacture. They can be anodized in Ceco's new, large-unit Alumiliting plant, the most modern in America. They are practical and reasonably priced, made so through design engineering.

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- Double-contact weather stripping on vertical and horizontal sections of operating sash give maximum protection from air and dirt. For minimum maintenance, windows can be furnished with inside bead glazing. This facilitates replacement of broken glass . . . from inside the building.
- There are no projections with double-hung, single-hung or fixed windows. Windows of this type are ideal for ground level exteriors.
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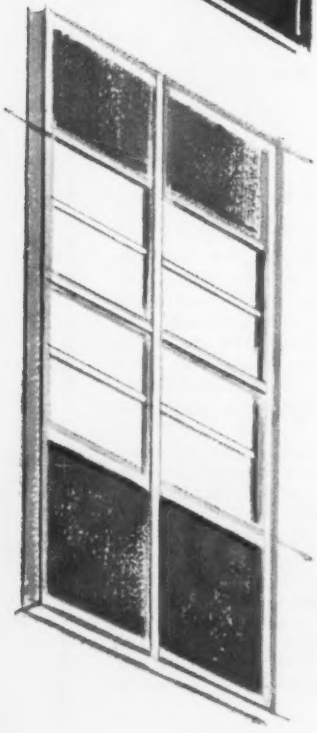

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Continued from page 122

conditions involving wood members; and truss plates for single-plane, trussed-rafter assembly. Timber Engineering Co., 1319 Eighteenth St., N.W., Washington 6, D.C.

On Free Data Card, Circle **219**

School-Building Economy with Plywood

New booklet on school construction, entitled *Stretch Educational Dollars Further with School Buildings Planned with Plywood,* is available. It shows in photographs how selected schools throughout the country have utilized plywood to help keep costs within budgets. Some of the methods discussed in the 20-page booklet are plywood folded plates, stressed-skin panels, barrel vaults, diaphragms, and plywood beams and trusses. Douglas Fir Plywood Assn., 1119 A St., Tacoma 2, Wash.

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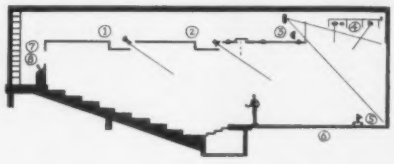
ELECTRICAL EQUIPMENT

Stage Lighting

Two technical bulletins on theater lighting have been published. *Engineered Lighting and Control Equipment for Open-Stage Theaters,* 12 pages, presents recommendations on equipment for school and community use. A complete lighting schedule is given for an open-stage theater suitable for a community playhouse or the dramatics department of a university. The second bulletin—also prepared by James Hull Miller, theater designer—is entitled *Lighting Systems for Children's Theaters.* In its 16 pages, it presents several lighting systems appropriate in size and cost for smaller stages and touring groups. Hub Electric Co., Inc., 2255 W. Grand Ave., Chicago 12, Ill.



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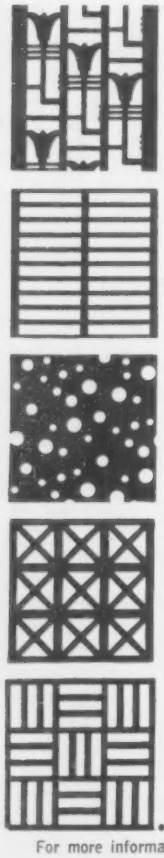
SPECIAL EQUIPMENT

Catalog of Wood Letters

Dimensional letters and identifications are described in new *Wood Letter Catalog,* 10 pages. The catalog illustrates 20 styles of stock letters, ranging in size from 4″ to 30″. Included and of special note are many new letter designs. Catalog also describes company's custom letter service, and gives information on embellishments, sign boards, fasten-

Continued on page 130



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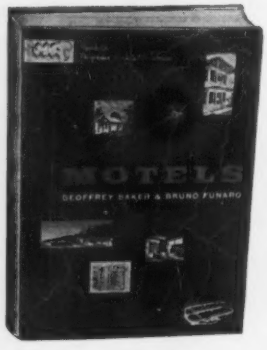

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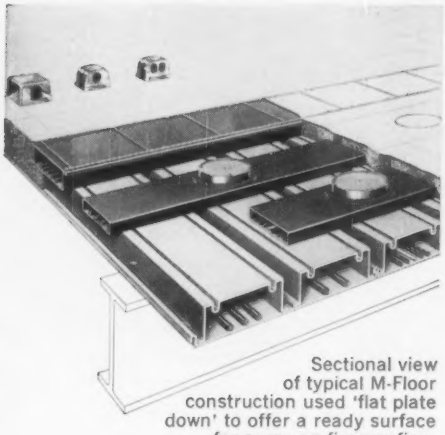

Sectional view of typical M-Floor construction used 'flat plate down' to offer a ready surface for spray-on fireproofing.

Mahon 3-in. beam depth M-Floors, during erection in eastern Pennsylvania project. General Contractor: McCloskey, Inc., Phila.

Artist's rendering of new facility for steel company. M-Floors permit quick... and flexible... electrical wiring of the facility. Architects: McKim, Mead & White, New York

■ Architects and engineers appreciate the proven advantages of Mahon M-Floors—application-designed for today's projects and tomorrow's demands. M-Floors are lightweight, high-strength steel cellular sections, in depths, spans, gages, and types to economically meet most criteria. They provide an ideal steel sub-floor for any kind of floor covering and have a high raceway capacity for the efficient electrical servicing of every square foot of floor space. Used flat-plate down, Mahon M-Floors permit full-depth concrete fill for maximum structural strength at supports, at the same time offer an even surface for easy and effective low-cost spray-on fireproofing. Find out what versatile M-Floors from Mahon can do for you . . . your designs . . . your budgets. Write for technical Catalog M-61 or see Sweet's Files.

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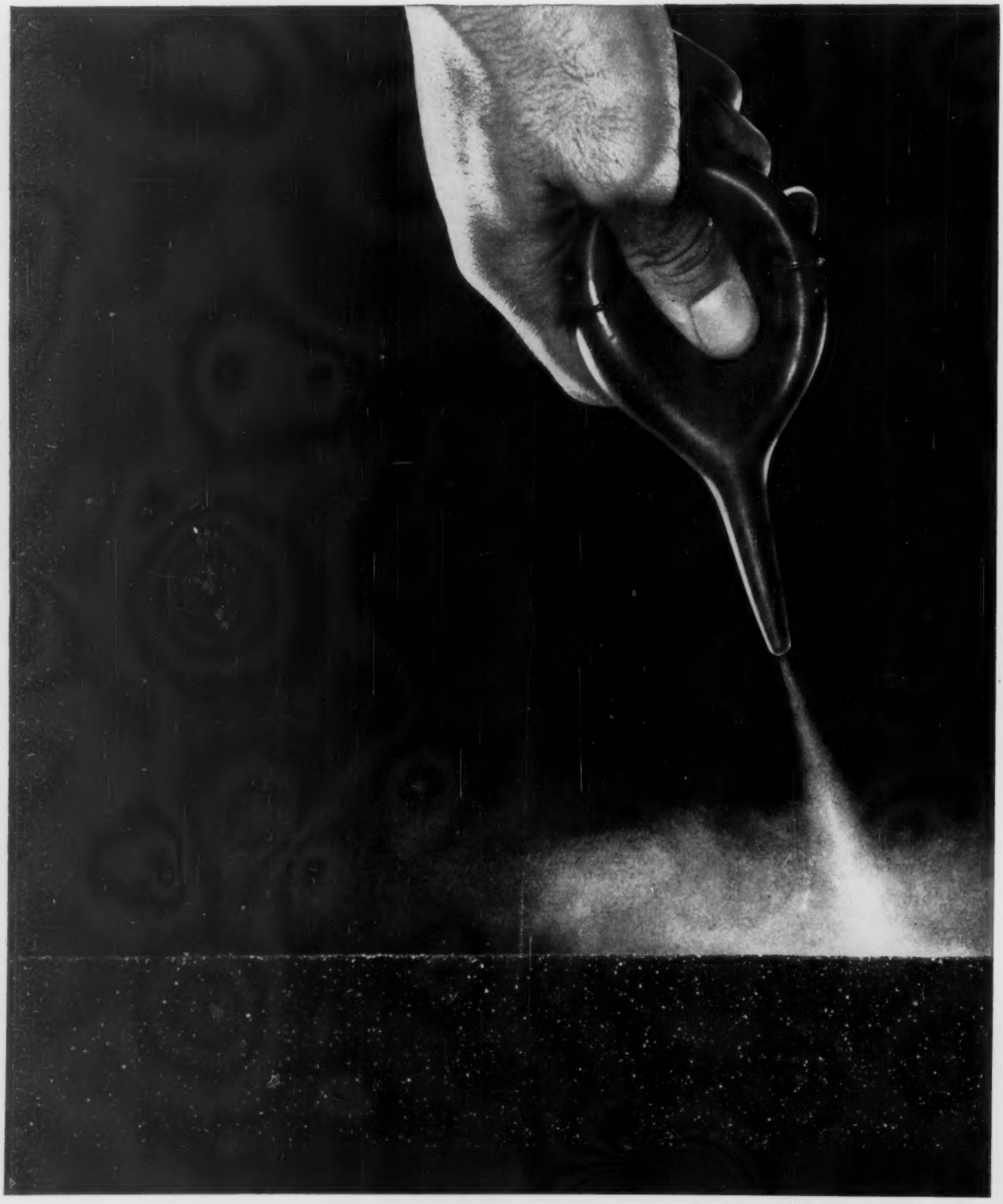
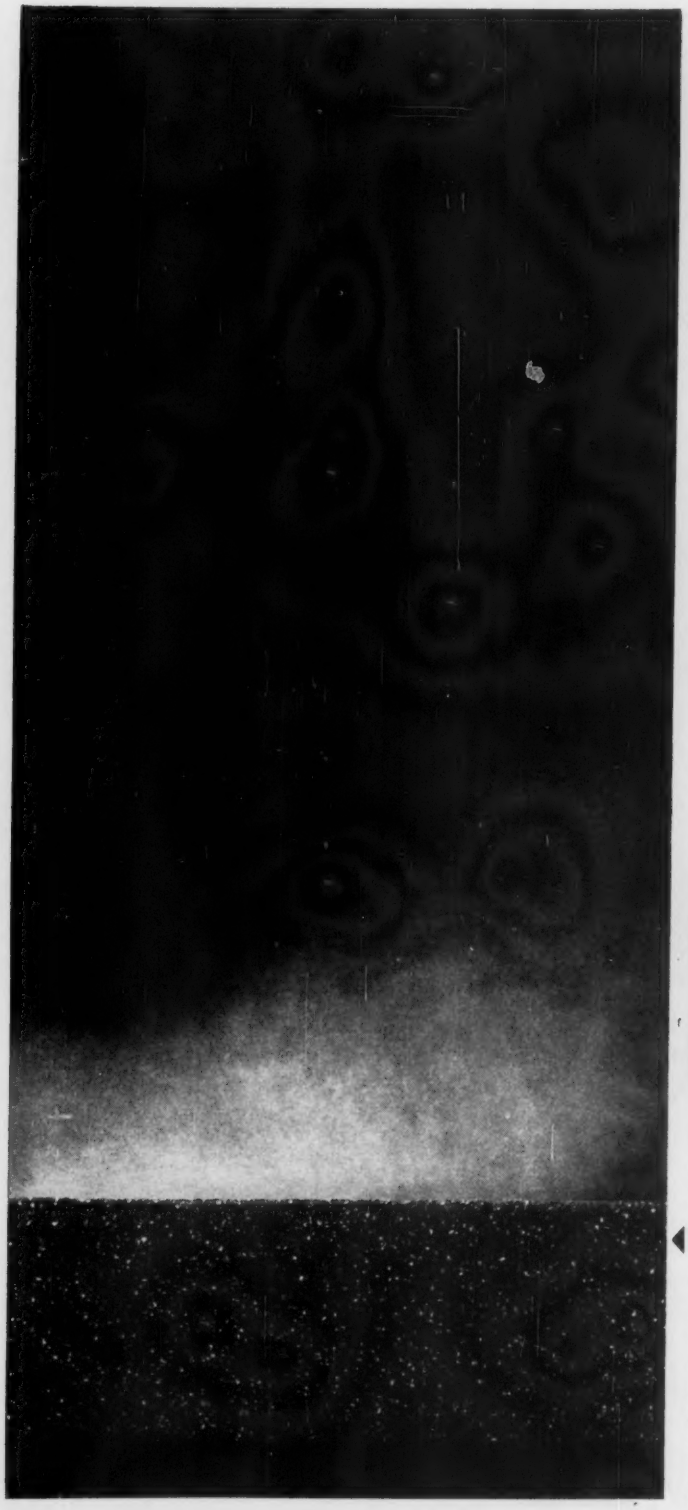


building material because it's **vaporproof** it's cellular glass



An unusual curtain wall panel makes unusual demands on its insulation. FOAMGLAS complements this Bell Telephone design, Conshohocken, Pa., where panels are projected to create vertical accents in depth. The cellular glass insulation stays impervious to vapor and water, maintaining its high compressive strength, firmness, rigidity and dimensional stability.

Over 82,000 sq. ft. of FOAMGLAS insulates these glass spandrel panels at the Connecticut General Life Insurance Building, Bloomington, Conn. Fabricated right on the job, FOAMGLAS protects the steel from air and moisture damage while it serves as the backing for the metal flashing that rings the building.

FOAMGLAS Stay-Dry Pipe Insulation provides the important benefits of FOAMGLAS for all building service lines; iced water, chilled water, low-pressure steam or dual temperature runs. In addition to the vapor and moisture protection, the insulation is fireproof, will not slump or sag, and will not compress around saddle supports.

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PITTSBURGH

PC

CORNING

Continued from page 126

ing methods, painting suggestions, and prices. A special section calls attention to new interior-display service, which provides a complete design program for retail establishments. Spanjer Brothers, Inc., 1160 N. Howe St., Chicago 10, Ill.

On Free Data Card, Circle 222

New Equipment for Commercial Kitchens

Seven representative spec sheets present new line of commercial refrigerators, which has been designed in accordance with the forthcoming National Sanitation Foundation Code. To maintain a more level temperature longer, and to reduce operating costs, 4″ insulation is used (compared to the usual 3″). Shelf supports will withstand rigorous conditions. For ease of cleaning, interior corners have been rounded. Tubular 6″ legs are now standard equipment on all models. Raetone Commercial Refrigerator Corp., Plymouth Meeting, Pa.

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New Hospital Bed Is Fully Motorized

Brochure, 4 pages, presents "a totally new idea in low-cost, fully motorized hospital beds." The product is the only fully motorized hospital bed designed from hospital personnel's specifications to assure simplicity and convenience. Among many features: "Touch-Toe" control plus patient switch to preset conditions, stretcher-level height (4″ to 8″ higher than other motorized beds), conversion into emergency operating table, no hazardous projections from main frame, and simple yet rugged construction (no complex mechanisms to go out of order). Ingersoll Products Div., Borg-Warner Corp., 1000 W. 120 St., Chicago 43, Ill.

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Large-Capacity Pumps

New 8-page *Bulletin B1400* describes a line of high capacity 3550 rpm and 1750 rpm submersible pumps for industrial, commercial, institutional and municipal water-supply systems. Capacities range up to 3400 gpm. A unique feature of these pumps is the use of corrosion-resistant bronze and stainless-steel construction. Sumo Pumps, Inc., Brown House Rd., Stamford, Conn.

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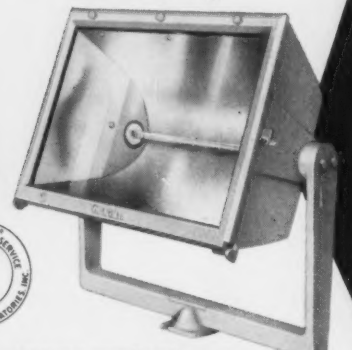

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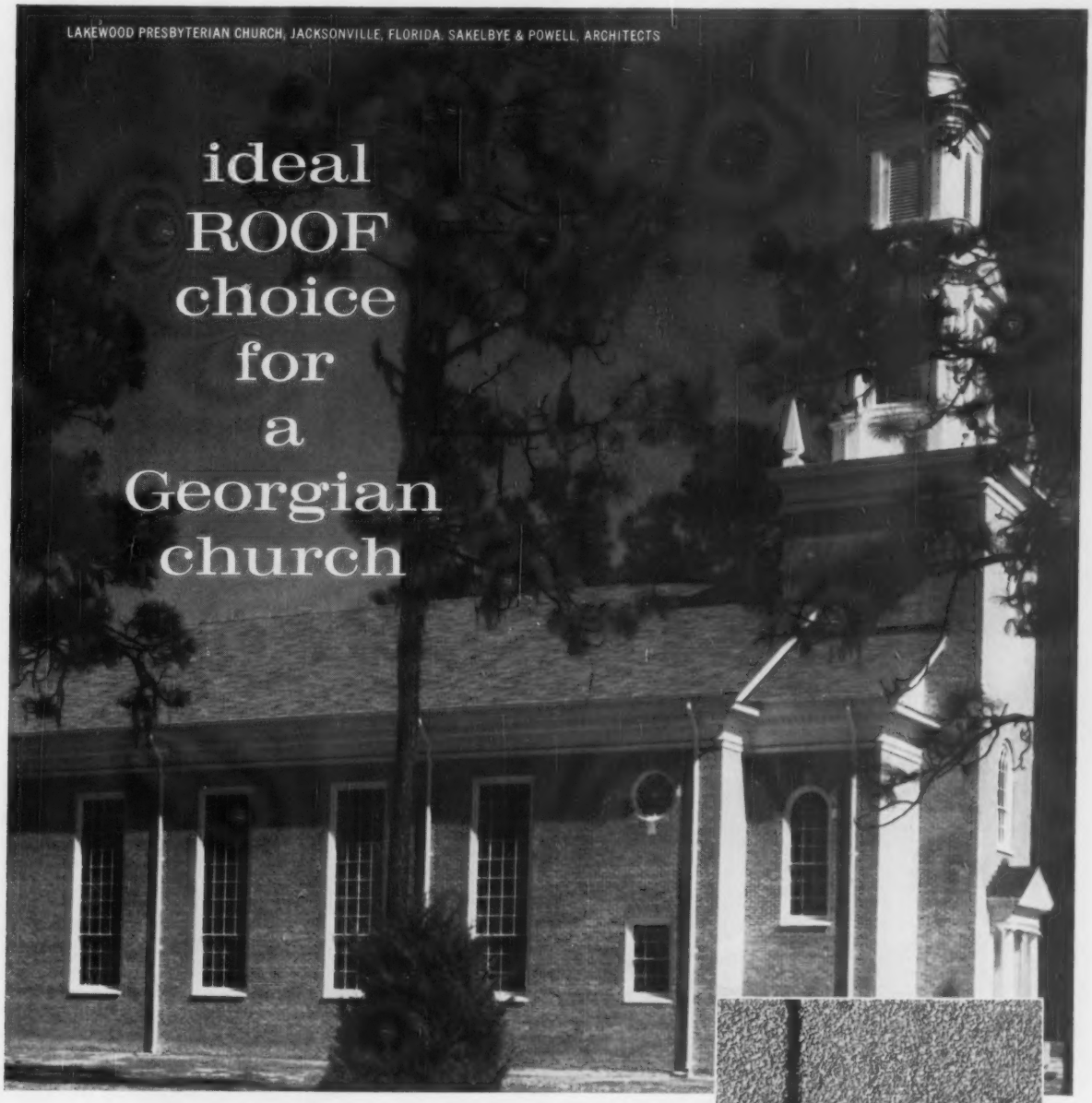

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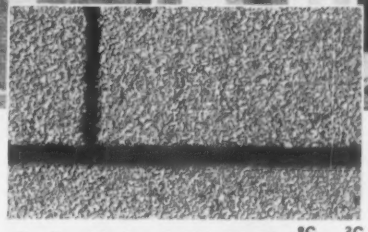

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Pier 40 Superstructure (Holland-America Line). Owner: City of New York, Department of Marine and Aviation; Architects and Engineers: Roberts & Schaefer Co., Inc.; General Contractor: Corbetta Construction Co., Inc. (all of New York).

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Insulite Roof Insulation comes in 24″ x 48″ and 23″ x 47″ sheets—½″, 1″, 1½″ or 2″ thick. Edges are square in the ½″ thickness. In other sizes you may order either square or shiplapped edges.

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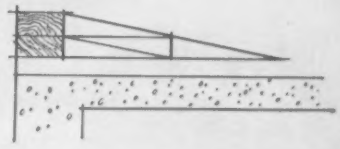
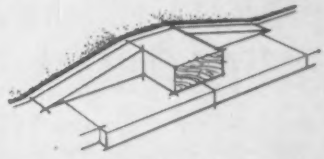


CARRY FELT SMOOTHLY TO ROOF EDGE. Insulite Tapered Edge Strip makes roofs more perfect than ever before. It underlies felt layers, eliminates sharp angles where cracks often develop, carries roofing felt smoothly over edge nailing member.



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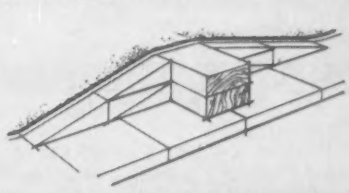

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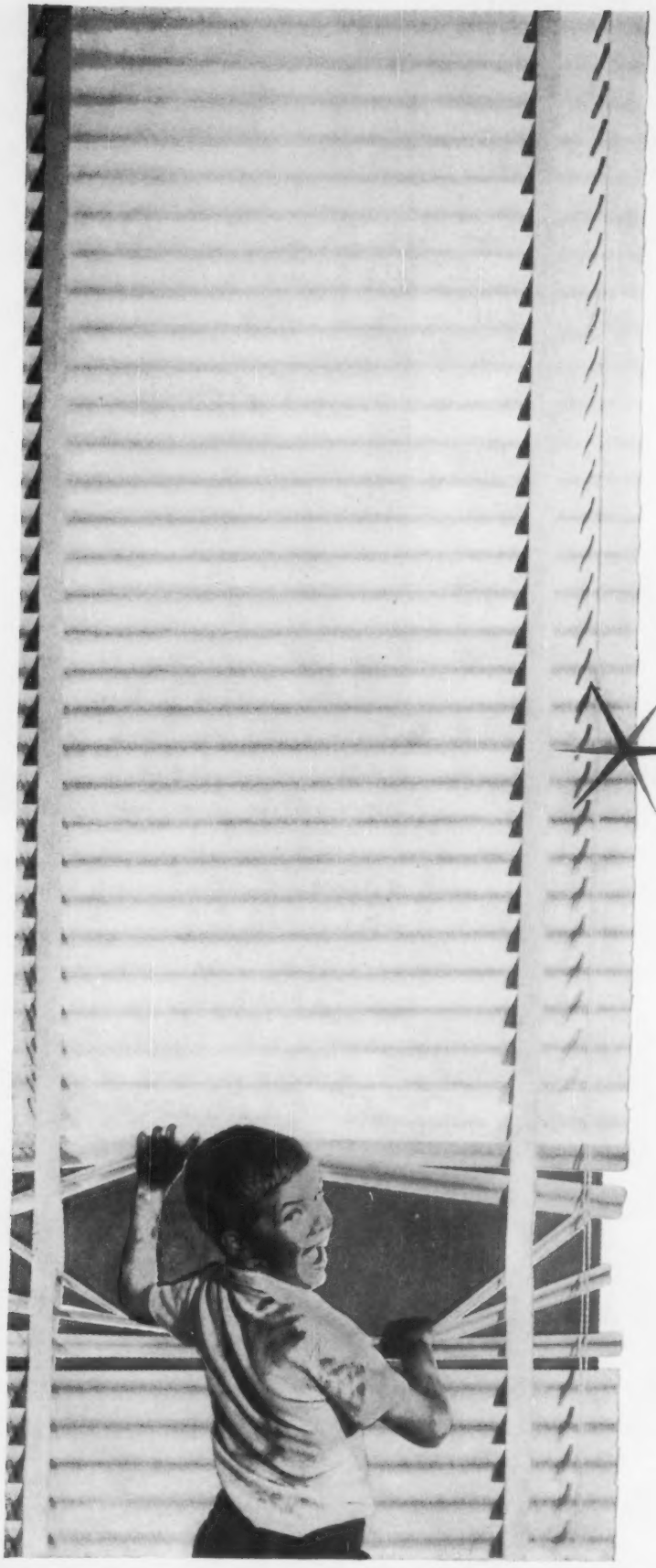

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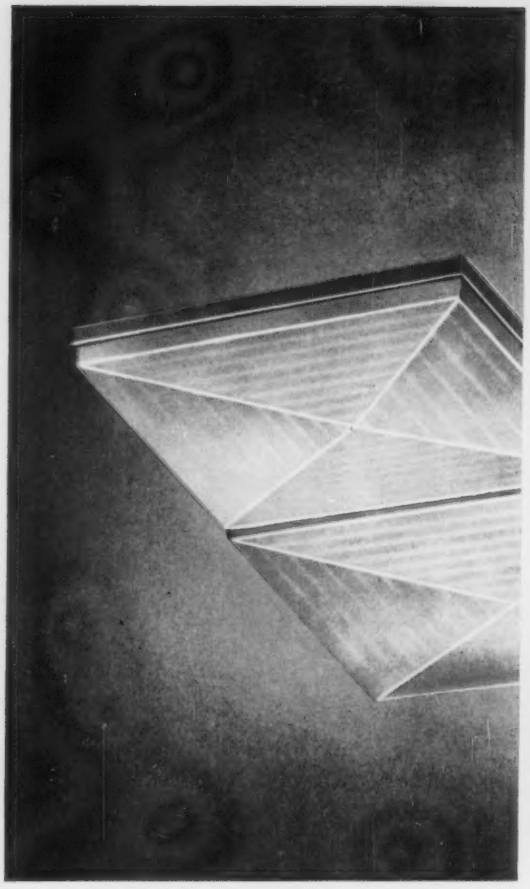

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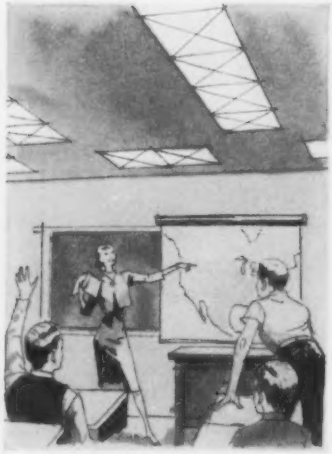

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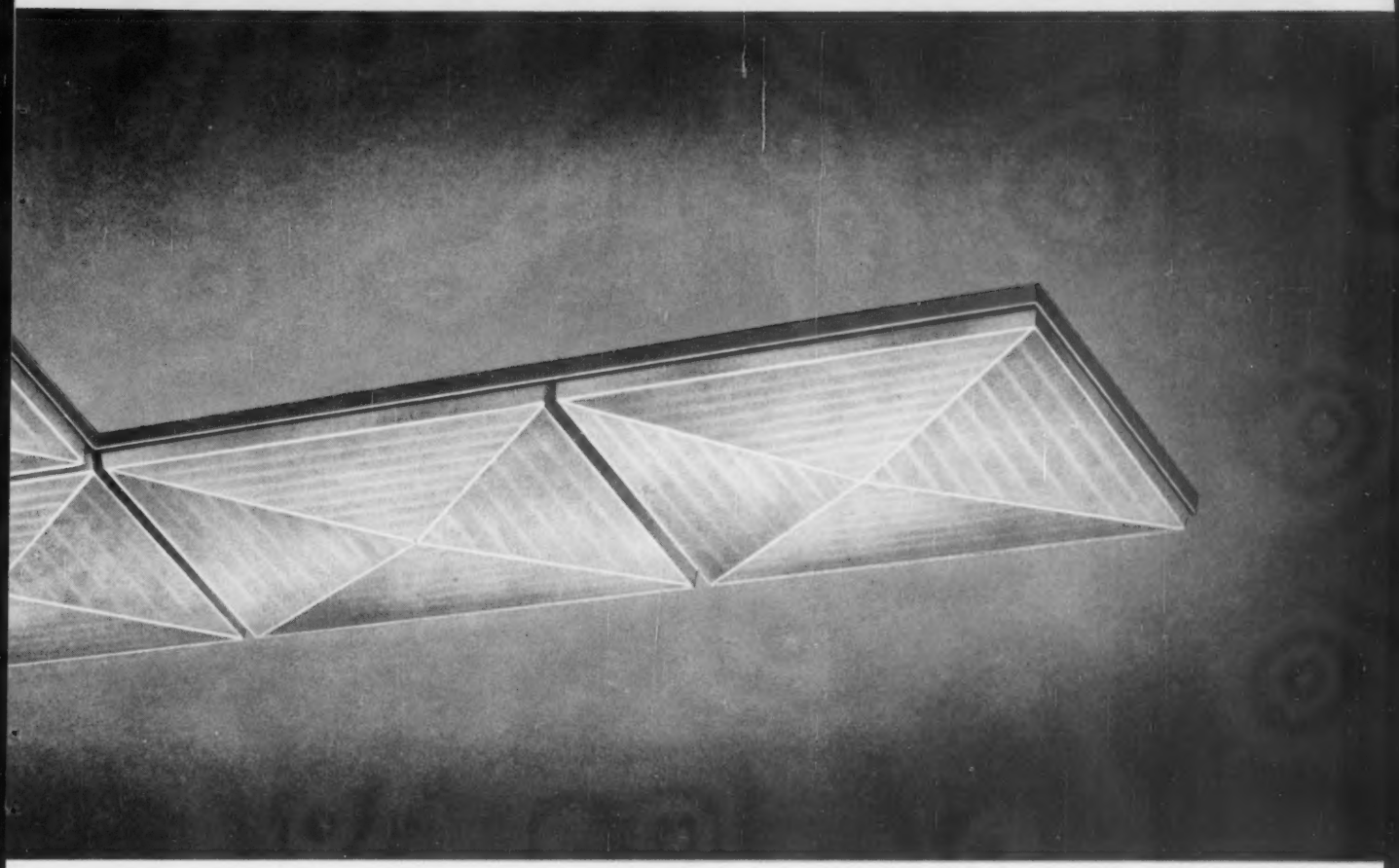

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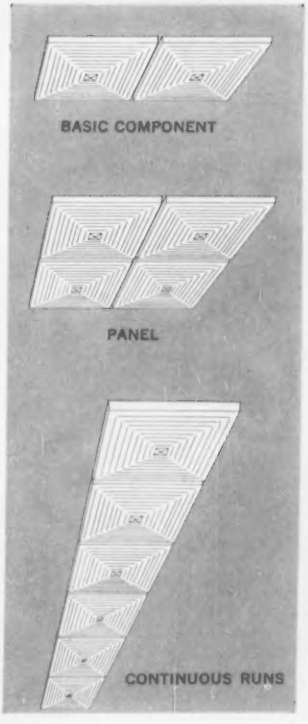

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City_____ Zone____ State_____

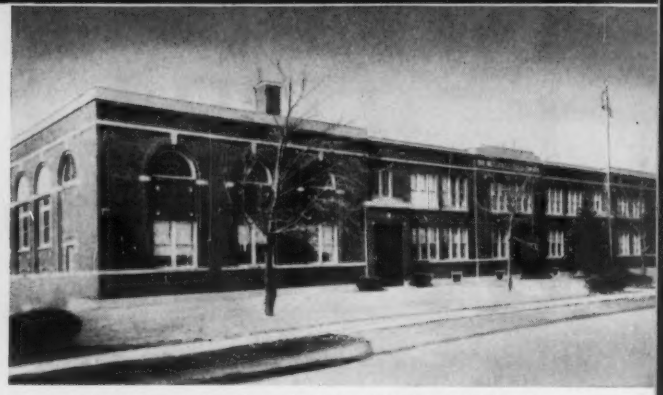
New from Koppers

25 years of bonded

+25

KOPPERS
ROOF BOND

This 27 year old store of the J. C. Penney Company in Milwaukee has been given a million-dollar-plus remodeling job which involved everything but the water-cooled roof. Although the Koppers coal-tar pitch roof has been constantly under water for 27 summers, it is still in excellent condition, and should last many more years.



The original 20 year bond on the John A. Nichols School in Syracuse expired more than 12 years ago, but this Koppers roof continues to give trouble-free service year after year. Its coal-tar base is totally resistant to water penetration. No other built-up roofing material can offer 32 year service records like these.

roof protection for the cost of 20!

So many Koppers roofs have been maintenance-free for twenty-five, thirty and even thirty-five years that Koppers has decided to introduce the Plus-25 Koppers Roof Bond, *with no extra premium charge!* The two roofs illustrated at left are examples of why we're offering architects this new 25-year roof bond. These roofs are typical of numerous installations that have established 25-year plus service records.

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AN INDOOR SPORTS ARENA–OPEN AS ALL OUTDOORS

It hasn't been built yet. But a sports arena like the one envisioned here with its soaring lines and its spacious, obstruction-free interior *can* be built. Faster, more durably and with fewer dollars than you probably imagine.

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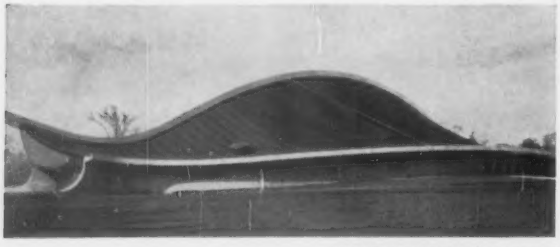

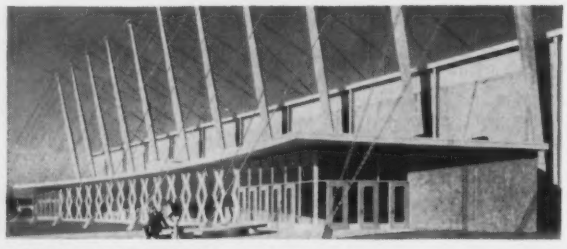

SUSPENSION ROOFS NOW AT WORK...

YALE UNIVERSITY'S–DAVID S. INGALLS ICE HOCKEY RINK, NEW HAVEN, CONNECTICUT • Architect: Eero Saarinen and Associates, Bloomfield Hills, Michigan • Consulting Engineers: Severud-Elstad-Krueger, New York City • Contractor: George B. H. Macomber, Boston, Mass and New Haven, Conn. • Cables by Roebling

NEW HEALTH AND PHYSICAL EDUCATION BUILDING, CENTRAL WASHINGTON COLLEGE OF EDUCATION AT ELLENSBURG, WASHINGTON • Architect: Ralph Burkhard, A.I.A., Seattle • Structural Engineers: Anderson, Birkeland, Anderson, Tacoma • Prestressed Concrete Fabricator: Concrete Technology Corp., Tacoma • Cables by Roebling

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Main lobby of the new Reynolds Area Joint High School located near Greenville, Pennsylvania, showing one of the decorative designs created through the use of Natco Vitritile structural clay facing tile.

Some of our best salesmen are customers!

We admit that we would find it difficult to tell our Natco Ceramic Glazed Vitritile sales story any better than three men who were responsible for its extensive use throughout the new Reynolds Area Joint School in Western Pennsylvania. So . . . we defer to the experts!

DONALD E. HUNTER—*Partner in architectural firm of Hunter, Heiges & Gross:*
"We wanted to use a material that would require little maintenance and offer a wide range of stimulating colors that would hold fast through the years. That's why we specified a ceramic glazed product."

DAVIS A. CHIODO—*H. H. & G. supervisor of selection and application of color materials:*
"Since we had so many colors available through the use of Vitritile, it would have been foolish *not* to take advantage. With Vitritile the overall color scheme will *always* retain the architect's original idea."

PARK LENHART—*Masonry Contractor:*
"Vitritiles' 8W Series larger unit size and smooth, ground edges resulted in an estimated 8% to 10% reduction in laying time. This savings, coupled with a substantial savings in material costs, resulted in lower *overall* costs."

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Today's idea becomes tomorrow's showplace . . . when Natco structural clay products are in the picture

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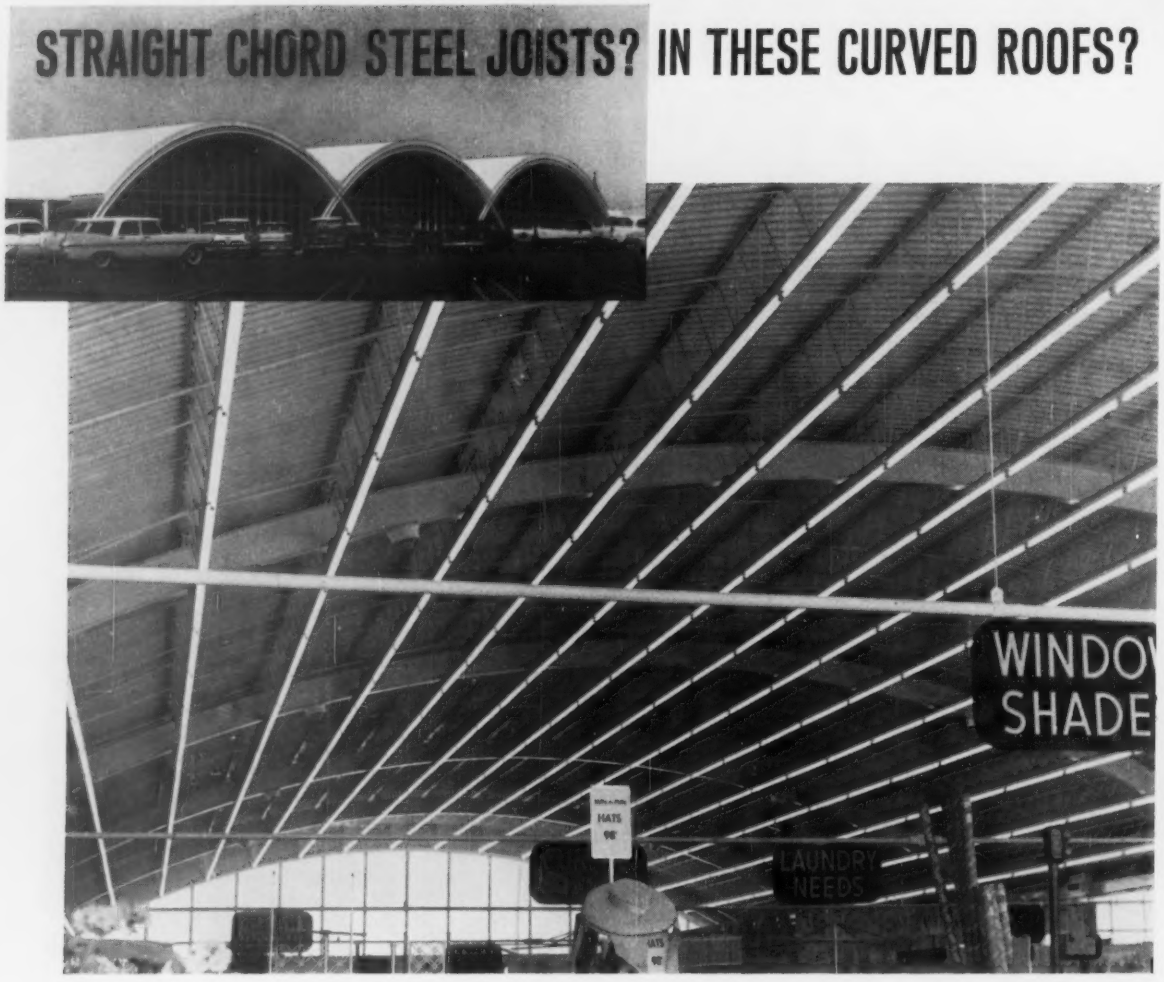
STRAIGHT CHORD STEEL JOISTS? IN THESE CURVED ROOFS?



They were used here—with economy and efficiency!

One of the biggest advantages of Laclede Open Web Steel Joists is their versatility—their adaptability to practically any architectural style.

Here's an example: the interesting new store recently opened by Central Hardware Company, biggest and best known retail hardware chain in the St. Louis area. It was designed by Schwarz and van Hoefen, and built by Alport Construction Co., both of St. Louis.

Notice how the joists were set longitudinally across the arched I-beams, forming a strong, lightweight, firesafe base for the cylindrical arches. Observe another practical little touch: the fluorescent lighting tubes attached to the bottom chords of the joists for the entire depth of the store.

No matter in which style you design or build, you'll find many time-saving, cost-saving uses for versatile Laclede Open Web Steel Joists.

STEEL JOIST INSTITUTE MEMBER

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Terrazzo lobbies cost less to maintain

No other flooring material can match the long-range economy of smooth, jointless terrazzo in public lobbies. Under the heaviest traffic, terrazzo stays new-looking, beautiful – and safe. It requires no waxing, buffing, repairing – only an occasional wet mopping. (Terrazzo can easily save as much as 23¢ per sq. ft. every year in cleaning labor alone.)

When you plan terrazzo floors, wainscots, stairs – consider the advantages of a matrix of ATLAS WHITE portland cement. Only a uniform white cement brings out the true value of colored aggregates and coloring pigments. Write for brochure showing color reproductions of terrazzo with a white cement matrix: Universal Atlas Cement, 100 Park Avenue, New York 17, N. Y.

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Universal Atlas Cement
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Venetian terrazzo flooring and precast column covers made with ATLAS WHITE cement at the Denver Hilton Hotel. **Architect:** I. M. Pei & Associates, New York. **Terrazzo Contractors:** Joint venture of J. Bartoli Company, Inc., and Texas Terrazzo Company, both of Dallas. Precast column covers by Otto Buehner & Co., Salt Lake City.

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INTERIORS

New approaches to many standard design problems with products by Johns-Manville

Every interior design presents the problem of combining esthetics and practicality. Both requirements are met by the workable solutions you see on these pages. All were created with versatile materials made by Johns-Manville.
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More than 100 years of research and experience stand behind all Johns-Manville building materials. They will help build your clients' prestige as well as your own, whether your problem is a new interior or a re-design.

Interior Designer: Eleanor Le Maire

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Invisible in this picture is J-M Micro-Flexboard®, an asbestos-cement sheet flexible enough to conform even to curved surfaces. Made to close tolerances and with strict surface uniformity, it is especially adaptable to laminating with handsome wood veneer as shown on the rear wall at left, or with metal or plastics.

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Panels of J-M Corrugated Transite®—slit, and backed with mineral wool pads—provide effective sound control and an attractive solution which follows the wall contours of this school auditorium.

Architect: Jess J. Jones, AIA

Associated Architects: Graham, Anderson, Probst & White, Inc., and Raymond S. Kastendieck & Associates.

Interior Designer: Raymond Wing Jean, RA, NSID

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Everywhere you look

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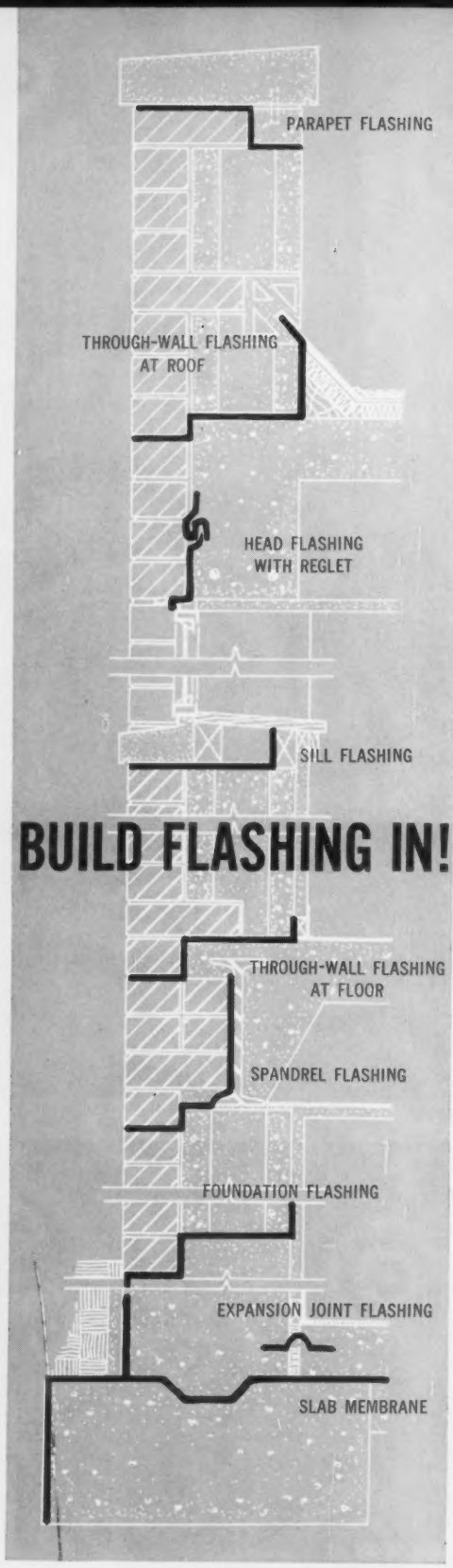

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September 1961 **PROGRESSIVE ARCHITECTURE**®

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Photo: Robert Lawrence Pastner

Frontispiece ELECTRIC STEEL FURNACE AT NEWPORT STEEL CORPORATION
Photo: Robert Lawrence Pastner

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TECTONIC STEELS

For decades, steel in its various forms has been one of the primary materials used in construction; its versatility as a tectonic material has made it **the** material for countless building applications. In recent years, however, other building technologies have been developed to challenge the use of steel products in many of their traditional roles in the art of building. Some steel producers, as well as representatives of the AISC and AISI, have been aware of this trend, however, and have brought to the architect a new range of high-strength steels, have developed more useful design procedures, and have championed uses of steel in areas where its advantages cannot be surpassed. This special issue reports on some of the latest developments in tectonic-steel components now available to the designer, and presents structures in which these are found.

SPECTRUM OF STEELS

BY DR. JOHN B. SCALZI

Recently there have been numerous advances in the properties of tectonic steels, as well as new techniques for their application. The author, a structural engineer, reviews many of these developments. In addition to giving an appraisal of code adoption for the new steels and a report on current research in progress, he predicts their effect on future architecture. Dr. Scalzi is a member of the Market Development Division of the United States Steel Corporation.

What does the future hold for steel as an architectural material? Unquestionably there are those who, having worked with steel for many years, tend to consider it as too commonplace or too familiar to present any real challenge to the imagination.

Yet in truth, broad, virtually unlimited horizons for this most versatile, durable, and economical architectural material are just beginning to unfold.

Never before in the history of the steel industry have there been so many new steels, steel products, diversified fabricating techniques, and steel-design concepts at the call of the architectural profession.

The proof that steel—architecturally speaking—is as new as tomorrow is already evident. One need only look at some of today's new steel structures and products to glimpse the magnitude of the bold and imaginative future that lies ahead.

In Chicago, for example, the world's tallest marble-faced office building will soon be occupied in the bustling downtown hub of that Midwest metropolis. Located at State Street and Wacker Drive, this skyscraper, which will be the home office of the United Insurance Company of America, embodies many modern concepts of steel design. It makes extensive use of ASTM A440 high-strength steel in the columns for the three basement levels and its first 23 floors. Other significant features of this 41-story office building are: (1) the steel columns were fabricated and erected in three-story units instead of two; (2) stainless-steel angles were selected to support the Georgian white marble on the face of the structure; and (3) an A242 high-strength, low-alloy steel with superior resistance to atmospheric corrosion was used for fuel tanks in the building. This new structure is a remarkable example of how to apply the broad range of steel strengths and steel products now available to architects and engineers.

For the architect, recent developments in steel make it a more versatile material that can be fabricated in skeleton form to accommodate the geometric and aesthetic functions he desires. For the engineer, these developments in steel mean more efficient structural design—an apportunity to transform into reality the many theories which have been lying dormant in his imagination. With constructional steels that now range from a yield point of 33,000 psi to a yield strength of 100,000 psi, a challenging and fascinating design era is open to the architectural and engineering professions.

Properties of Constructional Steels

Breadth of usefulness offered by the several strength levels of constructional steels can be appreciated by comparing typical stress-strain curves for these steels **(1)**. The lower line represents the most familiar grade of structural carbon steel, ASTM A7, which has a minimum yield point of 33,000 psi. The line immediately above represents an improved structural carbon steel, ASTM A36, with a minimum yield point of 36,000 psi. High-strength and high-strength, low-alloy steels, designated as ASTM A242, A440, and A441, are indicated by the banded curve. These steels have yield points ranging from 42,000 to 50,000 psi, depending upon thickness. The top curve in this chart represents a "constructional alloy steel" having a minimum yield strength of 100,000 psi. It does not yet have an ASTM designation. Several companies produce this type of steel as a proprietary brand, one such being USS "T-1" constructional alloy steel. This quenched and tempered alloy steel was developed by United States Steel Corporation in anticipation of the need for a constructional steel of high-yield strength combined with exceptional toughness, ease of fabrication, and weldability.

The elastic portions of the stress-strain curves **(1)** all show the same slope, thus indicating that all of the steels have the same modulus of elasticity, E. This characteristic influences the economical use of the high-strength steels in members governed by stiffness requirements, as in slender columns where the allowable design stress is a function of the modulus of elasticity rather than the yield strength. The yield and tensile strength of the various constructional steels are tabulated (Table I) for easy reference and comparison.

Constructional steels can be easily fabricated in either riveted, bolted, or welded construction, when procedures recommended for each strength grade are followed.

In addition to possessing high strength, the high-strength, low-alloy steels covered by ASTM specification A242 are superior to structural carbon steel in atmospheric corrosion resistance. USS Cor-Ten, for example, is four to six times better than carbon structural steel in this regard, because its surface oxidizes to form a tightly adherent film over the material which inhibits further oxidation. This characteristic results in longer life for painting and galvanizing, and has also stimulated some designs using the material in its uncoated state.

A comparison of the corrosion rate with time for (1) USS Cor-Ten high-strength, low-alloy steel, (2) a copper-bearing steel, and (3) ASTM A7 structural carbon steel, is illustrated **(2)**. It is indicated that during the first year-and-a-half of exposure to the atmosphere, A242 steel has a slight loss in thickness and, therefore, weight. After this initial period, the rate of loss in thickness diminishes sharply and only a slight additional loss occurs during the remainder of the 20-year test period.

Copper steel shows some improvement over carbon steel, but both show a continuous loss in thickness over the 20-year period that is much greater than the loss incurred by A242 steel in the same time.

Selection of Proper Strength

With the many strength levels and other properties that are available to the designer, he can readily select those steels which most economically fit either the structure as a whole or its individual components. The United Insurance Company of America Building, for instance, used ASTM A440 steel in the columns of the

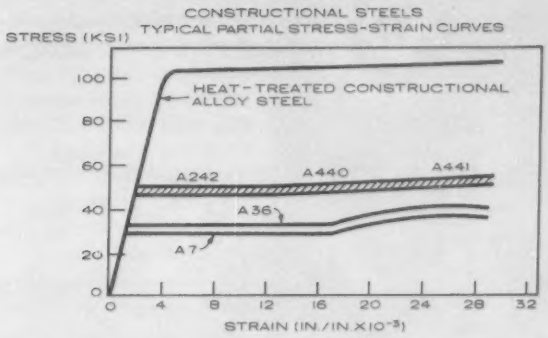
first 23 floors and ASTM A7 steel in the 18 remaining upper floors. This choice of material for the lower floors was prompted by the economy of using rolled shapes of high-strength steel, instead of lower strength steel shapes which would require the addition of cover plates to help carry the load. Thus the discriminating choice of steel strength resulted in direct savings in cost, and at the same time helped to meet the desired architectural arrangements throughout the entire building.

The availability of the several strengths of steel in the form of shapes and plates means that greater economies may be realized by substituting a lighter-weight, higher-strength steel section in place of a lower-strength section.

To aid the designer in deciding which one of the high-strength steels to use in columns, curves have been developed to indicate the theoretical range of economical use of the various strength grades. How the price-to-strength relationship varies with the slenderness ratio of the column, for values from 0 to 140, is shown **(3)**. Since the 0 to 90 range is where the high-strength steels are most frequently used, it has been plotted to a larger scale **(4)** to indicate the theoretical economies more effectively. It can be seen that the high-strength steels are more efficient in the lower ranges of slenderness ratio. This means that when the loads are heavy and the column is short, the higher-strength steels become more economical.

It must be borne in mind that these curves are based on theoretical areas that may or may not be precisely available in the rolled shapes. The price used for the curves was the average net mill price of U.S. Steel Corporation in April 1961, and does not reflect the savings from reduced fabrication and shipping costs which may develop when using the higher strength steels. Therefore, economies may be realized at slenderness ratios greater than those indicated.

The relationship of areas, deflections, and relative prices for the various strengths of steels used in tension, short columns, and shapes in bending is tabulated (Table II). Similar data, when the steels are used for plates in bending, are indicated (Table III). A study of these curves and tables will serve as a guide for the architect and



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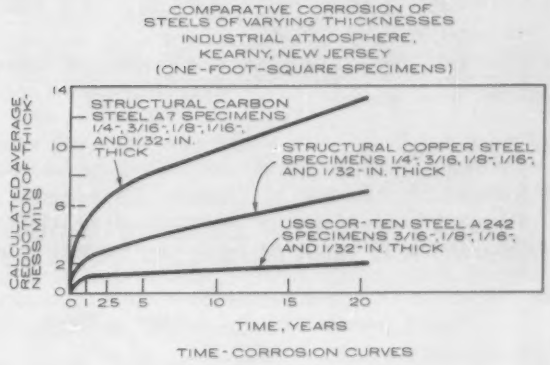
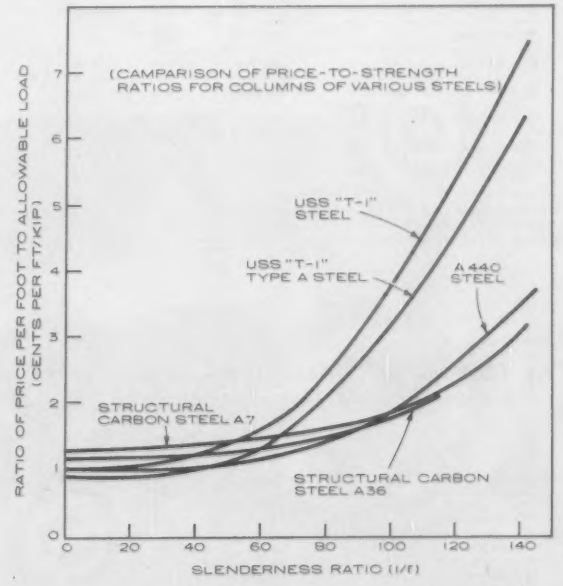
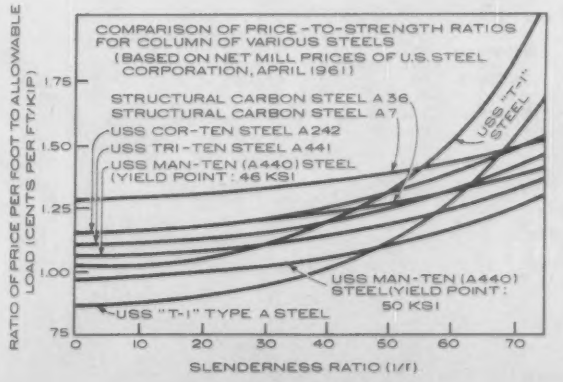

COMPARATIVE CORROSION OF STEELS OF VARYING THICKNESSES
INDUSTRIAL ATMOSPHERE, KEARNY, NEW JERSEY
(ONE-FOOT-SQUARE SPECIMENS)
CALCULATED AVERAGE REDUCTION OF THICKNESS, MILS
STRUCTURAL CARBON STEEL A7 SPECIMENS 1/4", 3/16", 1/8", 1/16", AND 1/32" IN. THICK
STRUCTURAL COPPER STEEL SPECIMENS 1/4", 3/16", 1/8", 1/16", AND 1/32" IN. THICK
USS COR-TEN STEEL A242 SPECIMENS 3/16", 1/8", 1/16", AND 1/32" IN. THICK
TIME, YEARS

TIME-CORROSION CURVES

2


(CAMPARISON OF PRICE-TO-STRENGTH RATIOS FOR COLUMNS OF VARIOUS STEELS)
RATIO OF PRICE PER FOOT TO ALLOWABLE LOAD (CENTS PER FT/KIP)
USS "T-1" STEEL
USS "T-1" TYPE A STEEL
A440 STEEL
STRUCTURAL CARBON STEEL A7
STRUCTURAL CARBON STEEL A36
SLENDERNESS RATIO (l/r)

3


COMPARISON OF PRICE-TO-STRENGTH RATIOS FOR COLUMN OF VARIOUS STEELS
(BASED ON NET MILL PRICES OF U.S. STEEL CORPORATION, APRIL 1961)
RATIO OF PRICE PER FOOT TO ALLOWABLE LOAD (CENTS PER FT/KIP)
STRUCTURAL CARBON STEEL A36
STRUCTURAL CARBON STEEL A7
USS COR-TEN STEEL A242
USS TRI-TEN STEEL A441
USS MAN-TEN (A440) STEEL (YIELD POINT: 46 KSI
USS "T-1" STEEL
USS MAN-TEN (A440) STEEL (YIELD POINT: 50 KSI
USS "T-1" TYPE A STEEL
SLENDERNESS RATIO (l/r)

4

TABLE I YIELD AND TENSILE STRENGTHS OF CONSTRUCTIONAL STEELS

ASTM Number	Steel Designation	Section Thickness	Specified Minimum Strengths (psi)	
			Yield Point	Tensile Strength
A7	Structural Carbon	All	33,000	60,000
A36	Improved Structural Carbon	To 4″ incl.	36,000	60,000
A440	High-Strength	To ¾″ incl. Over ¾″ to 1½″ incl. 1½″ to 4″ incl.	50,000 46,000 42,000	70,000 67,000 63,000
A441	High-Strength, Low-Alloy	To ¾″ incl. Over ¾″ to 1½″ incl. 1½″ to 4″ incl.	50,000 46,000 42,000	70,000 67,000 63,000
A242	High-Strength, Low-Alloy (Enhanced Corrosion Resistance) (USS Cor-Ten Steel)	To ½″ incl. ½″ to 1½″ incl. 1½″ to 3″ incl.	50,000 47,000 43,000	70,000 67,000 63,000
None	Heat-treated Constructional Alloy a. USS "T-1" type A Steel b. USS "T-1" Steel	5/16″ to 1″ incl. 5/16″ to 2½″ incl.	100,000* 100,000*	115,000 115,000

* Yield Strength at .005″/″ extension under load.

TABLE II ECONOMY OF CONSTRUCTIONAL STEELS: TENSION MEMBERS, SHORT COLUMNS AND SHAPES* IN BENDING

ASTM Number	Steel Designation	Yield Point Or Strength (psi)	Relative Area	Relative Weight	Relative Price**	Relative Deflection
A7	Structural Carbon	33,000	1.000	1.000	1.000	1.00
A36	Improved Structural Carbon	36,000	0.917	0.917	0.931	1.09
A440	High-Strength	50,000	0.660	0.660	0.763	1.52
A441	High-Strength, Low-Alloy	50,000	0.660	0.660	0.866	1.52
A242	High-Strength, Low-Alloy (Enhanced Corrosion Resistance) (USS Cor-Ten Steel)	50,000	0.660	0.660	0.897	1.52
None	Heat-treated Constructional Alloy a. USS "T-1" type A Steel b. USS "T-1" Steel	100,000*** 100,000***	0.330 0.330	0.330 0.330	0.681 0.799	3.03 3.03

* Over-all dimensions, depth of section and width of flanges, are assumed to be the same for all steels.
** Based on net mill prices of U.S. Steel Corporation, April 1961.
*** Yield Strength at .005″/″ extension under load.

TABLE III ECONOMY OF CONSTRUCTIONAL STEELS: PLATES IN BENDING

ASTM Number	Steel Designation	Yield Point Or Strength (psi)	Relative Thickness	Relative Weight	Relative Price*	Relative Deflection
A7	Structural Carbon	33,000	1.000	1.000	1.000	1.00
A36	Improved Structural Carbon	36,000	0.958	0.958	0.973	1.14
A440	High-Strength	50,000	0.812	0.812	0.939	1.87
A441	High-Strength, Low-Alloy	50,000	0.812	0.812	1.066	1.87
A242	High-Strength, Low-Alloy (Enhanced Corrosion Resistance) (USS Cor-Ten Steel)	50,000	0.812	0.812	1.104	1.87
None	Heat-treated Constructional Alloy a. USS "T-1" type A Steel b. USS "T-1" Steel	100,000** 100,000**	0.575 0.575	0.575 0.575	1.186 1.392	5.26 5.26

* Based on net mill prices of U.S. Steel Corporation, April 1961.
** Yield Strength at .005″/″ extension under load.

engineer in the selection of the strength of steel best suited to his structure.

Since the cost of fabrication and erection is proportional to the number of pieces handled rather than the size of the individual members, it is not surprising to find that the fabrication cost per ton increases, since there is less tonnage involved. However, under favorable circumstances this may be more than offset by the reduction in the number of tons, with a resultant saving in the total cost of the job.

Shipping cost is reduced when high-strength steels are used, since less weight is required in the individual members.

The cost of handling and erecting the steel may be reduced slightly due to the ease of handling lighter members. However, in general, a saving is not expected here, since the cost is related to the number of members handled rather than the weight. Again, a higher cost per ton may be expected as a result of the lighter members used.

Economic Advantages. The availability of several types of steel properly and judiciously used in bridge and building designs will result in many intangible as well as tangible advantages, as follows:

1 Savings in weight—less cost.
2 Simplified fabrication—thinner sections to handle, less welding.
3 Stress raisers eliminated—uniform thicknesses eliminate abrupt changes.
4 Reduced maintenance—uncluttered joints and smooth surfaces.
5 Lower shipping costs—due to reduced weights.
6 Easier handling and erection.
7 Less fireproofing—smaller members.

Architectural Advantages. Of direct interest to the architect are the advantages to be gained with respect to the layout of the building:

1 Increased usable floor space when smaller columns are used.
2 Simplification of architectural details because columns are nearly the same size throughout the height of the building.

Influence on Current Structures

Technological advances in the analysis and design of structures, combined with developments in fabrication using various strength levels of steel, are becoming more apparent in contemporary architec-

ture. Many structures which have been built, and many more which are in the planning stage, use one or more of the new steels with the latest methods of design and construction. Architects have been aware of the capability and economy of steel and have exercised their creative imagination in its application.

Because of its increasing use, the American Institute of Steel Construction adopted in August 1960 its "Specification for Architecturally Exposed Structural Steel" as a guide for architects and engineers. The specification discusses the fabrication, handling, erection, and painting of the exposed steel.

As an architectural material, steel lends itself economically to a skeleton-type framework with cover on the exterior and a ceiling, wall, or floor on the interior. This versatility makes steel an excellent tectonic material. With the steels used either bare or painted, structures are often designed that accent the steel frame. Recent noteworthy examples of exposed-steel framing are a house **(5)** in Houston—an award winner in the AISC's 1961 Architectural Awards of Excellence Program—and the Magnavox Research Laboratories **(6)** at Torrance, Calif. In these structural arrangements, the geometrical pattern of the steel also serves as a design element.

As noted earlier, A242, a high-strength, low-alloy steel, is four to six times more resistant to atmospheric corrosion than structural carbon steel; consequently, it is being considered in the bare condition for exposed columns of an eight-story building. When constructed, this will be the first use of unpainted steel in a large office building. This use of unpainted steel is also under study, on an experimental basis, in a transmission tower of a high-voltage power line which was erected in Massachusetts.

The architect's wish for plasticity in his design is realized in the ability of fabricators to shape steel to a desired configuration and form. There are few limitations to the geometrical forms that may be achieved or the curves that may be fabricated. The use of engineering judgment in the selection of the proper strength of steel is beneficial in reducing weight, fabrication costs, welding, and handling of the plates and shapes—as in the recently completed Pittsburgh Public Auditorium **(7)**.

The need to span large areas for such structures as arenas, auditoriums, exhibition halls, and terminals has focused the attention of the architectural profession on the benefits of using cables as roof-supporting members. Since a cable resists tension easily, it lends itself to spanning large distances economically, as in a suspension bridge.

Interesting structures and desired functions may be achieved gracefully by the imaginative use of steel as exemplified by

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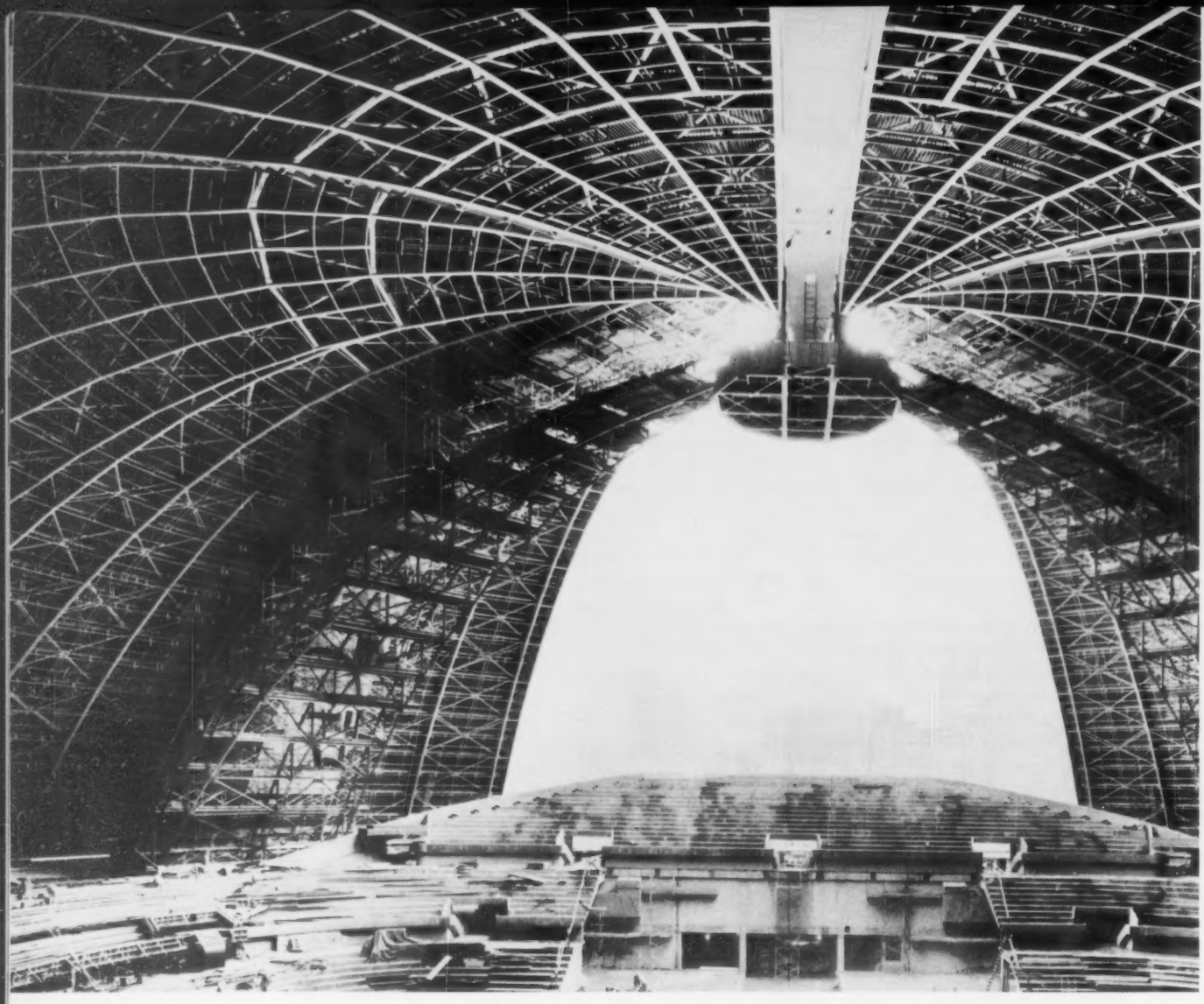


the roof of the chapel for the Air Force Academy (page 183).

New Steel Products

New Lightweight Sections. In the fall of 1960, the steel producers announced the availability of new wide-flange sections. These sections were developed primarily to fill the need for lighter weight members in the range of sizes from 18 to 36 in. in depth, and two new 14- and 16-in. light beams. These new beams are listed below:

36 WF 135 27 WF 84 18 WF 45 14 B 26
33 WF 118 24 WF 68 16 B 31 14 B 22
30 WF 99 21 WF 55 16 B 26

The advantage to be gained by using the new sections is that sometimes a new lightweight section of the same depth as the original design may be used to carry a given load; in other cases, a slight increase in depth may allow a saving in weight. Savings may range up to 18½ per cent in some instances.

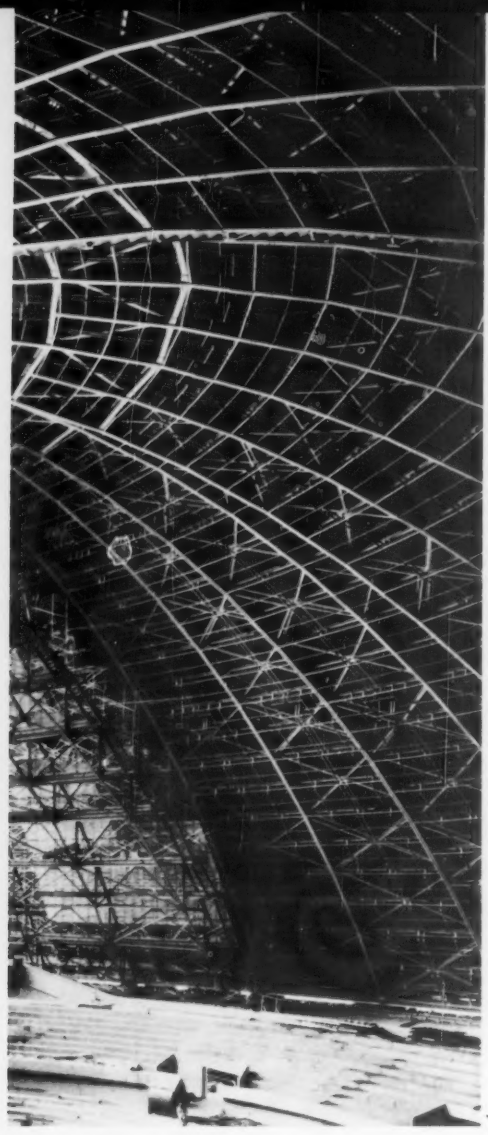
Constructional Alloy Steel Shapes. The rolled structural shapes of quenched and tempered alloy steels, which were introduced earlier this year, should be of special interest to architects and structural engineers. Heat-treated to design strengths as much as three times that of structural steel, the new shapes are furnished in standard I-beams, channels and angles, and in lengths up to 40 ft.

The shapes are available in various quenched and tempered alloy steel compositions including "T-1" and "T-1" type A constructional alloy steel.

Heretofore, engineers who wanted the benefits of quenched and tempered alloy steel structural shapes have had to fabricate the desired sections by welding plate material together. Now, however, ready-rolled shapes costing only slightly more than the quenched and tempered plate material can be conveniently obtained. A preliminary survey indicates that the use of the new shapes can bring savings of about 30 per cent, as compared to the cost of fabricating similar sections from plate materials.

In some cases, where it has been impracticable to weld certain smaller shapes, the new rolled sections will serve many design needs.

In buildings, bridges, transmission and TV towers, and similar structures, the 100,000 psi minimum yield strength of "T-1" and "T-1" type A structural shapes



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will mean significant weight savings, not only in finished structures, but also in terms of the tonnage of material that has to be shipped to the job site and handled during fabrication and erection. Reducing the weight of structural steel also means that foundations will require less material.

New quenched and tempered structural shapes are available in many standard sizes and foot weights. I-beams are American Standard, ranging from Section B 8 (12″ deep by 3¼″ wide) through Section B 14 (6″ deep by 3⅜″ wide). American Standard channels are furnished in Section C 1 (15″ deep by 3⅜″ wide) through C 7 (6″ deep by 2″ wide).

Equal-angle shapes range in size from 3″ x 3″ to 8″ x 8″. The 3″ x 3″ angles are furnished in thicknesses from 3/16″ to ½″; 8″ x 8″ angles range from ½″ to 1⅛″ thick. Unequal angles come in sizes from 3½″ x 3″ to 8″ x 6″. As with the equal angles, various thicknesses can be furnished in each basic size.

Sheet Products. Architectural applications for vinyl-coated steel sheets continue to increase. At present, uses for these colorful, attractively textured products are mainly confined to building interiors; their suitability for exterior use is still being evaluated. For interior partitions, such as doors, cabinet work, trim, and furniture, vinyl-coated steel sheets are undeniably superior to painted metals. Chief advantages of the vinyl coatings are found in their resistance to staining, fading, and, above all, to abrasion.

Painted steel sheets will continue to serve many architectural needs. Actually, their use could increase significantly if a long-awaited development becomes a reality. This involves prepainted sheets with coatings tough enough to remain unmarred even after severe forming operations. Fabricators of doors, partition panels, and other architectural products are keenly interested in the savings potential of prepainted materials.

Porcelain-enameled steel sheets, already widely used in panels and curtain walls, will probably find an even larger market because of two new research developments. One is a new type of steel sheet which can be successfully porcelain-enameled with a single coat instead of the two that were needed previously. The other development makes it possible to furnish porcelain-enameled sheets to improved standards of flatness.

Strong, economical, aluminum-coated

steel sheets are also available for many architectural uses. The aluminum surface can be colored in several ways: by anodizing, by dyeing, or by porcelain-enameling with low-temperature frits.

Colored stainless steel also appears to hold considerable interest for future architectural and structural uses. Two coloring techniques are presently available and continue to be refined. Porcelain enameling is one; the other involves coating the stainless-steel sheet with colored methacrylate lacquers.

The increasing architectural use of embossed and perforated sheets of carbon and stainless steels has prompted development of an ever-widening variety of patterns. Another process which improves structural strength with three-dimensional patterns of extremely deep corrugations may hold great architectural potential. It would permit the economical use of light sheets of carbon and stainless steel.

Steel curtain-wall panels with polyurethane foam cores have also been developed. These fire-retardent units provide low thermal conductivity without sacrificing strength, simplicity of manufacture, or economy. When used as exterior panels, they increase the usable floor space by 5 per cent when compared with masonry construction of equivalent heat resistance. A similar panel construction is used for interior doors and partitions.

Design Concepts

Theoretically, the thickness (and consequently the weight) of a structural-steel member can be reduced by one-third when high-strength steels are used in thicknesses of ¾ in. or less, and by two-thirds when a constructional alloy steel such as "T-1" is used in thicknesses of 2½ in. or less—and the member will still be as strong as the same member designed in structural carbon steel. The break-even point (price-wise) in thickness reduction is frequently less than that referred to above, but potential savings are within reach in most situations. In some instances, consequent savings from reduced requirements for supporting members and foundations may be realized. Specifically, in bridge design, these high-strength steels have been used where increased strength is needed together with a limitation on weight; in building columns it may be possible to use a high-strength steel rolled section at a lower cost than a built-up structural carbon steel section, thus simplifying fabrication. In other instances, money can be saved solely through weight reduction of the redesigned members. A few of the design concepts that are possible with the range of available steel strengths will be discussed and illustrated.

Simplified Building Columns. Design of columns for high-rise buildings may require the addition of cover plates on a rolled section in order to carry the large dead and live loads. The availability of several strength grades of steels in structural shapes makes a direct substitution possible, thus in some cases eliminating the need for cover plates **(8)**.

Boxed Truss Members. Advantages of using the entire range of steel strengths have been achieved by bridge engineers through what is becoming an accepted method of design for large-bridge trusses and plate girders. The same principles may be applied to the design of roof trusses for large auditoriums and other large clear spans.

The first large truss bridges to be designed and erected using the present family of constructional steels were the second Carquinez Strait Bridge and the Benicia-Martinez Bridge, both in California. These bridges used "T-1" steel in the most heavily stressed tension and compression members, A242 steel in the intermediate stressed members, and A373 steel in the members with small stresses.

Important features of these two bridges are: (1) the members are welded H and box sections; and (2) the tension members have their ends strengthened to compensate for the reduction in cross-sectional area for the field bolts. The tension members of the Carquinez Strait Bridge have slightly thicker plates butt-welded to the ends of the main plates to make up for the loss of section caused by the bolt holes **(9)**. In the Benicia-Martinez Bridge, the end plates on the A373 and A242 steel members are of the same thickness as the original plate, but are of the next higher strength steel. For example, a main member of A373 has an A242 steel plate at the joints, and an A242 steel member has "T-1" steel plates in the joints.

In the Carquinez Strait Bridge, the welded box members were fabricated with lightening holes for maintenance purposes. However, in a design proposed for the new Glenwood Bridge, to be built near Pittsburgh, Pennsylvania, these lightening or hand holes are to be eliminated. The object is to gain more efficient

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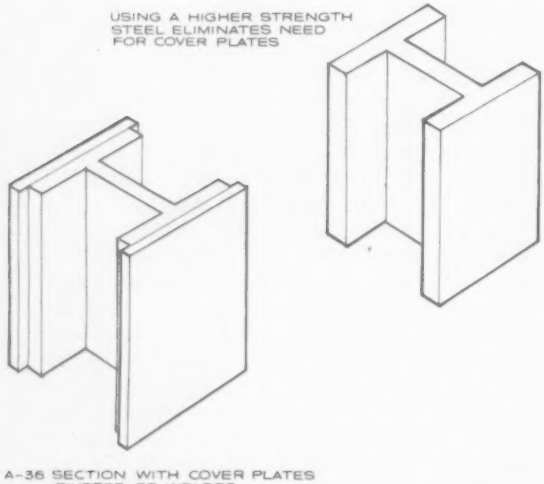

A-36 SECTION WITH COVER PLATES RIVETED OR WELDED

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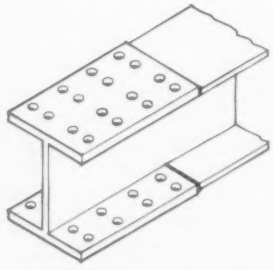
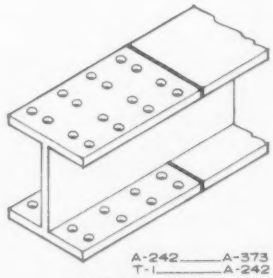


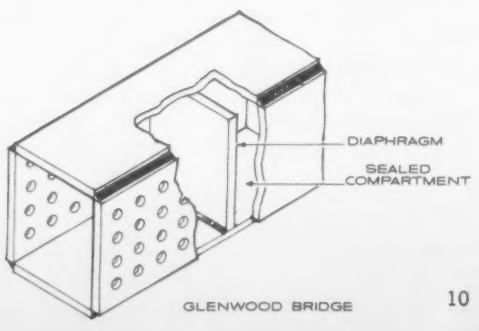
SAME STEEL, THICKNESS VARIES

CARQUINEZ STRAIT BRIDGE
BENICIA-MARTINEZ FOR T-1 STEEL



SAME THICKNESS DIFFERENT STEEL

BENICIA-MARTINEZ BRIDGE



GLENWOOD BRIDGE

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use of the material, and to simplify fabrication and maintenance, by welding diaphragms or bulkheads near the ends of the members, thus sealing the ends of the members and inhibiting internal corrosion. As a result, the only internal surfaces requiring maintenance painting are at the joints, thus reducing long-range costs as well as the initial cost. The bulkhead of this boxed section and the end connection for field bolting are shown **(10)**.

Plate Girders. Economy can also be realized by the use of the family of constructional steels through efficient design of plate girders for buildings, following the example for bridges of the Whiskey Creek Bridge in California. This is an example of how good design principles may be used to realize a monetary saving. The three-span, welded-steel plate girder has end spans of 260 ft and a center span of 350 ft, which includes a suspended span of 260 ft. A principal feature of the bridge is its constant web depth of 144 in. throughout its entire length. To obtain this constant depth, three different strengths of steels were used. "T-1" steel is used in the web and flanges of the most highly stressed sections, A242 steel is used in the regions of intermediate stress, and A373 steel is used in the regions where the stresses are the least.

Since the Whiskey Creek Bridge is a cantilever structure, the bending moments are large over the supports and in the middle regions of the spans. Therefore, the distribution of the three grades of steel are based on this moment diagram and are proportioned accordingly. The position of the various steels is shown in a diagrammatic sketch of the bridge **(11)**.

The flanges are a constant 1¾ in. thick, except for 90 ft in the central portion of the middle span where the flange thickness is increased to 2 in. The web is a constant ¾ in. thick throughout.

To illustrate the principle that was utilized, a simple beam supporting a uniform load is illustrated **(12)**. The bending-moment diagram is the usual parabola with the maximum moment at the center. In this region of maximum moments and stresses, "T-1" steel is used for the web and flange. As the moments and stresses become smaller, A242 steel is used; toward the ends of the member, as the stresses become smaller, A373 steel is used. With the recent changes made in the ASTM designations, ASTM A441 would replace ASTM A242 and, for buildings, ASTM A36 would be used instead of ASTM A373.

Another interesting example of the use of three strength levels of steel in plate-girder bridge design is the proposed Dartmouth Street Bridge in Minneapolis.

This is to be a haunched continuous girder of welded construction that uses "T-1" steel for the web and flanges of the most heavily stressed regions, and A441 steel for the web and flanges in the lesser stressed portions. However, for ease of fabrication, maximum material usefulness, and to avoid the penalties of the lower strength of A441 steel more than 1½ in. thick, it was found expedient to use "T-1" steel for the flanges when the thickness of the A441 steel exceeded 1½ in. This procedure in the Dartmouth Street Bridge permitted the A441 steel in the web to be stressed to its maximum allowable value in bending, and the "T-1" steel in the flange to be understressed. The higher cost of the "T-1" steel was more than offset by the improved utilization of steel in the web and savings in shipping and fabrication. How the three steels were used is indicated **(13)**.

Prestressed-Steel Beams. A unique application of the higher strength steels currently under investigation is in the design of a prestressed steel beam. One technique is to use an A36 rolled shape which has been loaded (by jacking) to induce stresses in the beam opposite to those which will be imposed by the applied loads. The induced stresses are locked in the beam by welding a "T-1" steel plate to the beam section after the section has been flexed a predetermined amount **(14)**.

When the design loads are applied to the beam, they must offset the induced moment in the beam before they can produce the allowable stresses in the beam and cover plate. The load-carrying capacity of the beam can be increased by using this technique of prestressing the the steel beam. Demonstration tests have been performed to verify the theory and develop the technique further. This idea is currently being used by a state bridge department for a three-span highway bridge.

Prestressed-Steel Trusses. The principle of prestressing is also applicable to steel trusses. It was applied in the design of a large floor and roof truss which is being used to build additional parking space at the Port of New York Authority's Manhattan bus terminal in New York City

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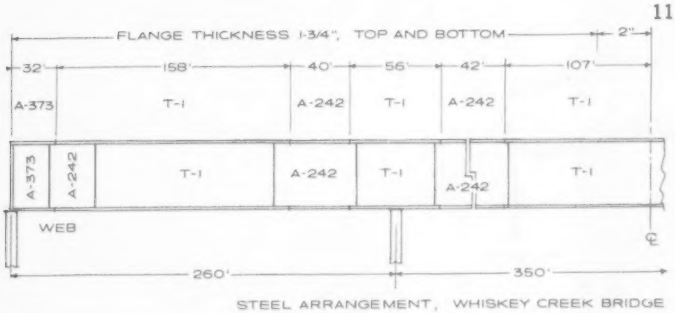
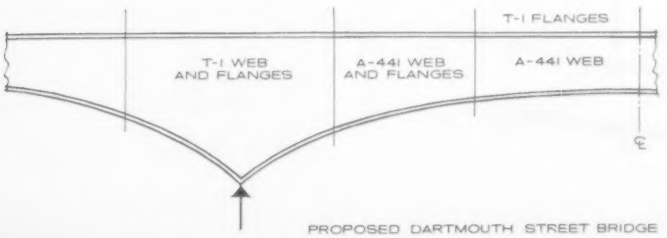


STEEL ARRANGEMENT, WHISKEY CREEK BRIDGE



PROPOSED DARTMOUTH STREET BRIDGE

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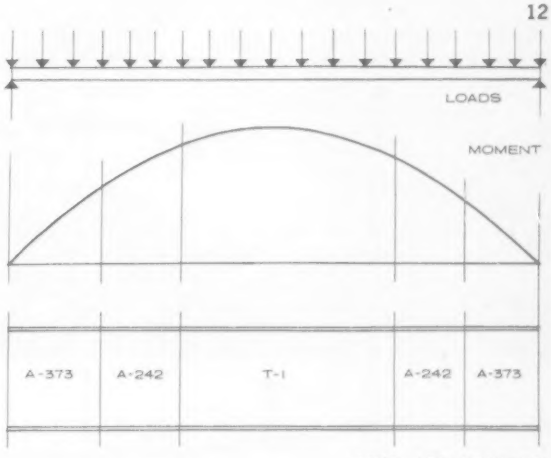

STEEL ARRANGEMENT

13

(15). Eight bridge strands on each bottom truss chord serve to reverse the direction of secondary stresses in the structure and to absorb a portion of the dead and live loads.

Shear Connectors. A development in bridge design is now finding its place in the design of building frames. This is the method of "composite design" in which the steel beam is made to act in tension and the concrete floor slab becomes the compression flange of the dual material beam. To transfer horizontal shear stresses and to hold the concrete to the steel beam, shear connectors are welded to the beam. These are of several types, including channels, spirals, and studs **(16)**. The use of the floor slab acting compositely with the steel-supporting members results in a more efficient beam design for the floor beams and girders of the steel skeleton, and a 10 to 15 per cent cost saving.

Composite Steel and Concrete. Another interesting example of using the several strengths of steels economically is in composite design of steel and concrete **(17)**. The beam section is designed to serve two loading conditions: (1) the dead load of the wet concrete on the steel beam; and (2) the design live and dead loads on the composite section of steel and concrete. This technique of construction is currently being used advantageously in designing building beams and floor systems using a rolled section of one specific strength of steel **(18)**.

In the case of welded girders, the top flange of the steel is needed as the compression flange of the beam resisting the weight of the concrete, and also as a means of holding the shear connectors. It is, therefore, designed smaller than the bottom flange and may be of structural carbon steel, A36 **(19)**. The web and bottom flange are needed to resist all the applied loadings and may be of a high-strength, low-alloy steel, such as ASTM A441 steel. Other combinations of an A36 or A441 steel top flange and a web and bottom flange of "T-1" steel can be used if the loads are heavy enough to warrant its use in a specific design.

Unique Designs

As knowledge of structural analysis advances, architects and engineers are pooling their imagination and creative abilities to design structures that are not only functional but aesthetic achievements as well. A few examples will be cited to indicate the degree to which this integration of architecture and engineering has progressed.

The Yale University Rare Book Library is a design which makes excellent use of the Vierendeel Truss as the principal structure for the four sides of the building **(20)**. Since the building is supported at only four points, similar to the construction of a bridge, it requires a comparable design approach. The steel for the framework is specified as ASTM A441 steel, which is the weldable high-strength, low-alloy steel. This structure will be com-

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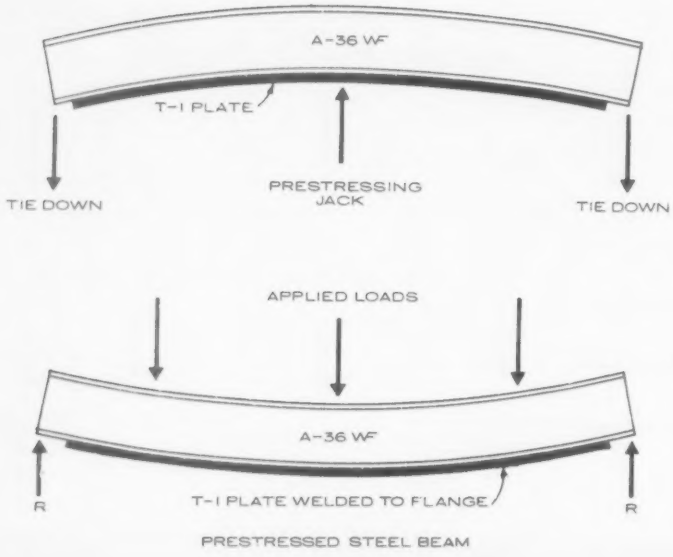

PRESTRESSED STEEL BEAM

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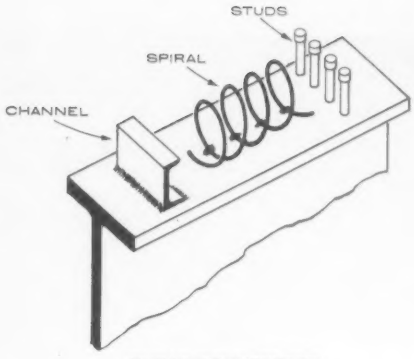

SHEAR CONNECTORS

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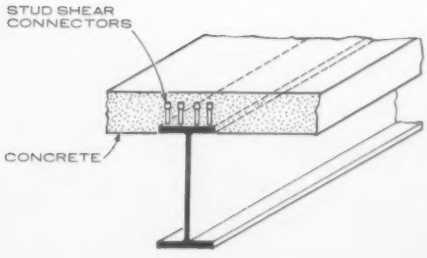

COMPOSITE SECTION
WIDE FLANGE BEAM

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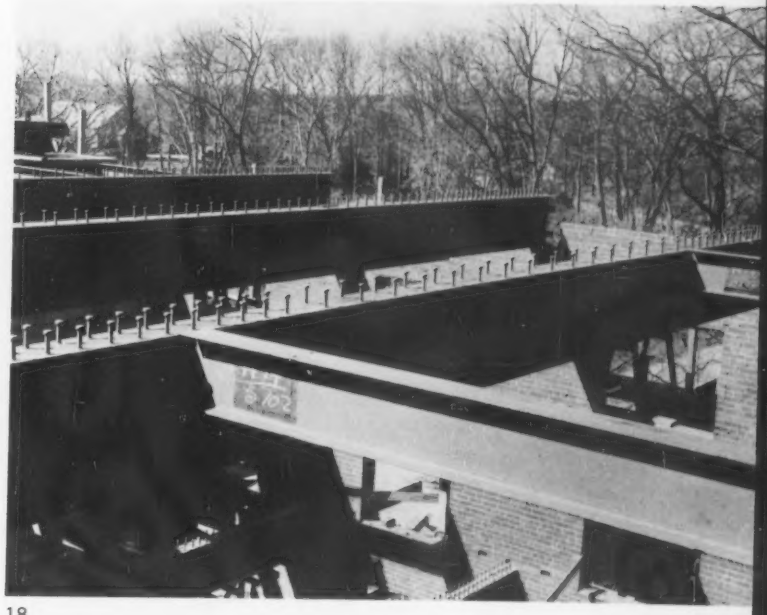

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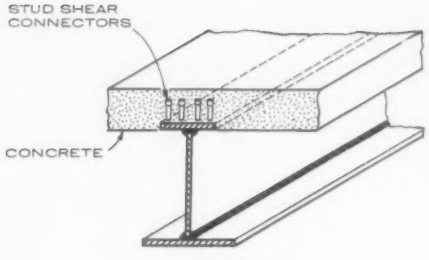

COMPOSITE SECTION
WELDED GIRDER

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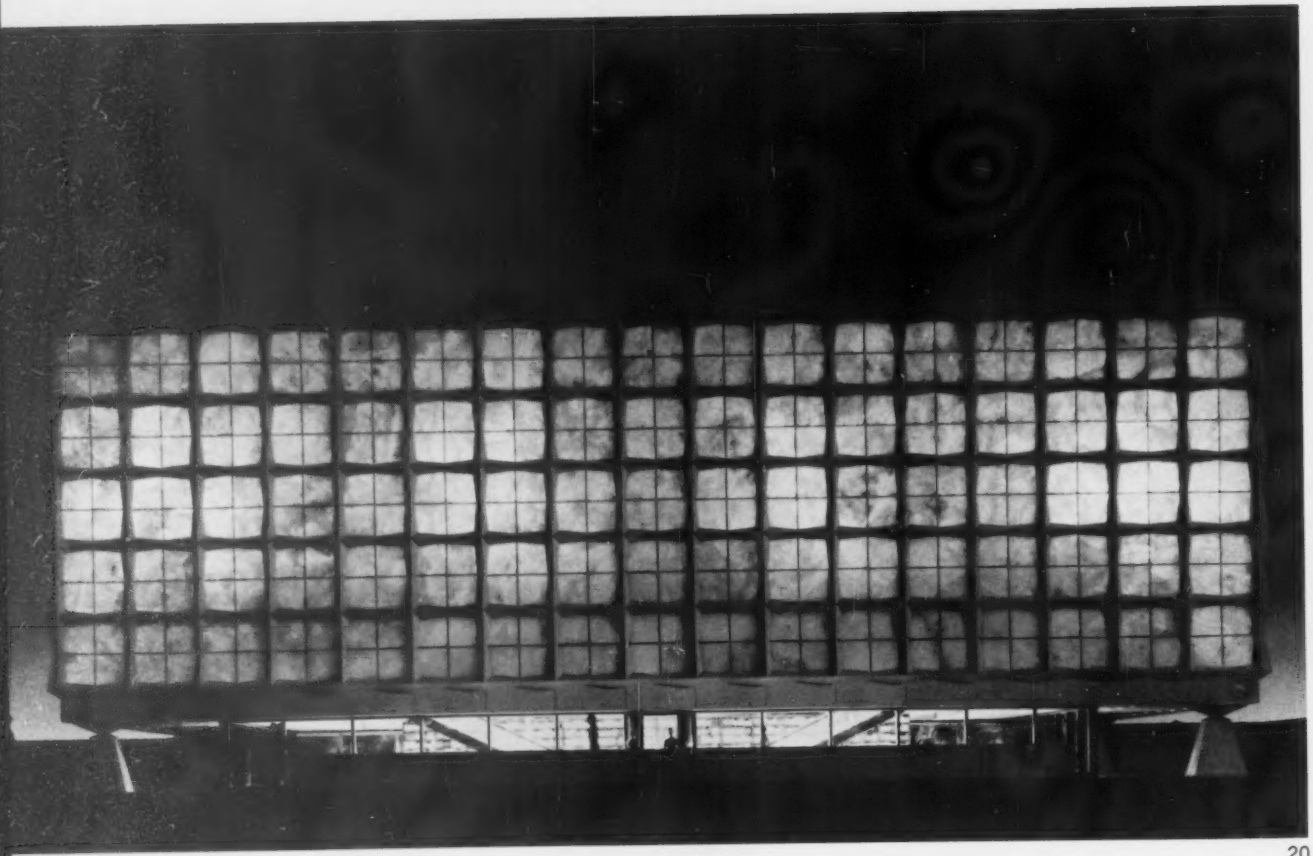

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pletely welded to achieve continuity of all joints. Its trusses support marble mullions and sills that frame translucent onyx sash panels.

A proposed restaurant for the Chicago O'Hare Airport is a skillful study in structure and geometry. A schematic outline is shown **(21)**. The design consists of a cable-suspended roof, with walls of a three dimensional rigid truss system which supports the triangular sash panels. The vertical truss system was adopted to satisfy the architectural form requiring a minimum of maintenance.

The design for the multiairline terminal at the New York International Airport, now under study, has an audacious scheme for a steel-truss roof **(22)**. The roof is tentatively composed of steel trusses arranged in a diagonal grid pattern supporting a poured concrete roof deck. Since the span is of the order of 200 ft in the short direction, every member of the roof system is made to work at maximum efficiency. The concrete roof is considered to act with the top members of the trusses, as the compression flange of the large roof plate and the tension chords house cables which are used to induce partial prestress-

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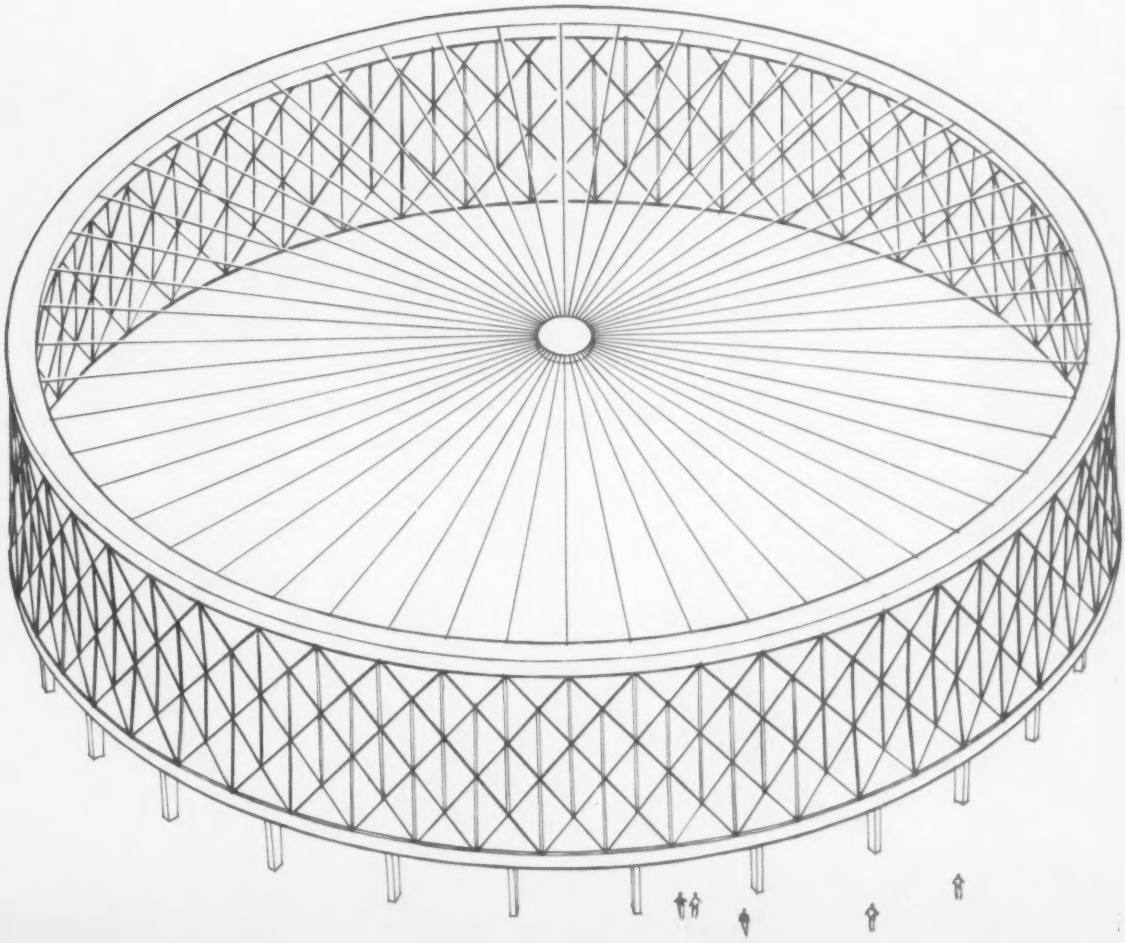
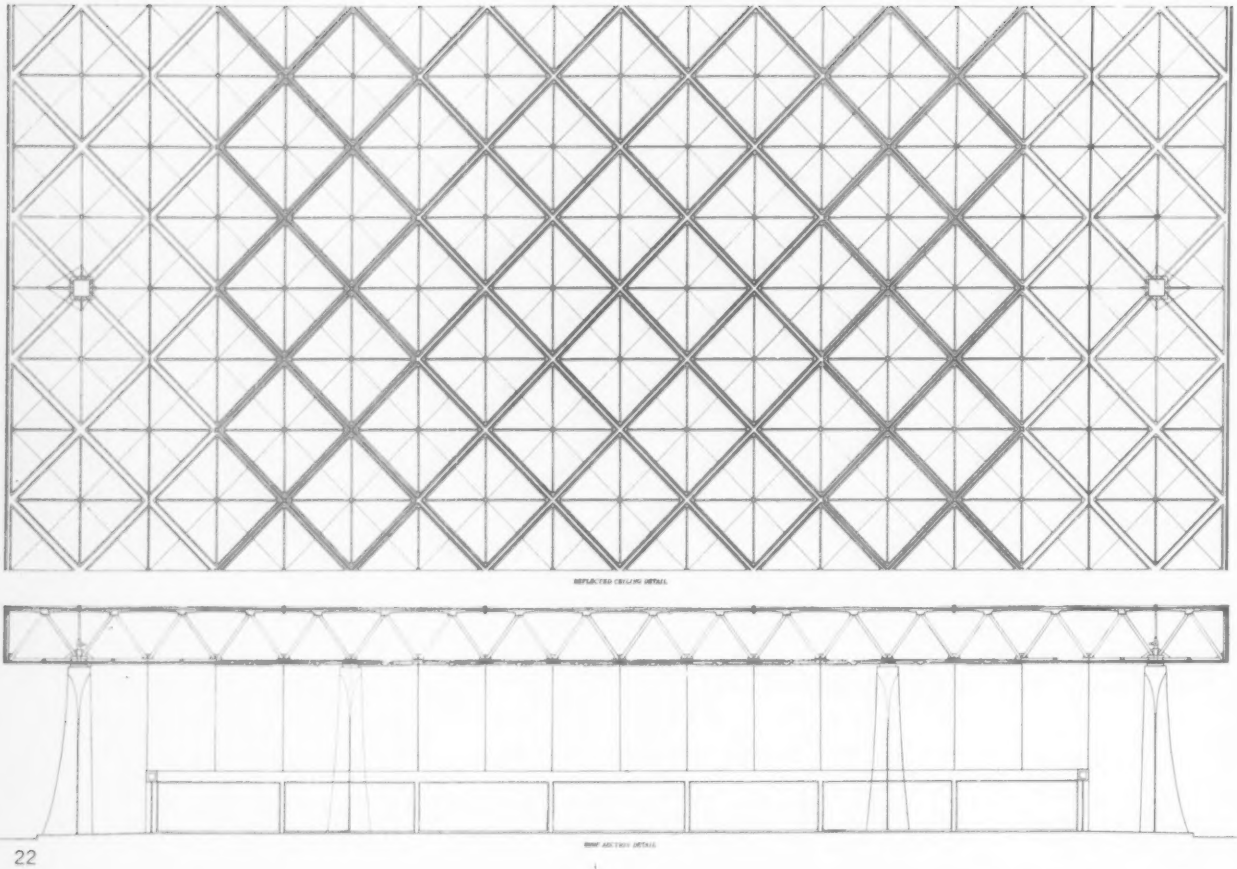




22

ing into the framing of the structure.

Code Adoption of New Steels

Application of steels with higher yield points than ASTM A7 has been progressing steadily since they were first introduced, and they are now becoming universally accepted by architects and engineers. The acceptance by building officials is dependent upon the local building code or the prescribed manner of securing approval for a new material.

Some cities, like Chicago, have a building code which permits the use of high-strength steels with a yield point of 50,000 psi. The code was written to include the possibility of such a steel being used in the Chicago area. Therefore, the design of the United Insurance Company of America building, using high-strength steel in the columns, became a matter of routine acceptance.

In those cities which accept the design specifications of the American Institute of Steel Construction, building officials will be able to approve designs as soon as the new specification, which includes provisions for use of high-strength and high-strength low-alloy steels, is issued. It is scheduled for publication this fall.

In those cities which do not provide for the use of the higher strength steels, an interim approval must be obtained from the building department for each specific project. Although this appears to be a stumbling block, very little opposition has been met when such approval was properly requested. Reference to existing structures and test data are always helpful in obtaining this first acceptance from the building departments.

Research in Progress

The steel industry is constantly searching for methods of making steel that will yield a product that is more economical, stronger, tougher, more corrosion resistant, easier to fabricate, weld and bolt, and

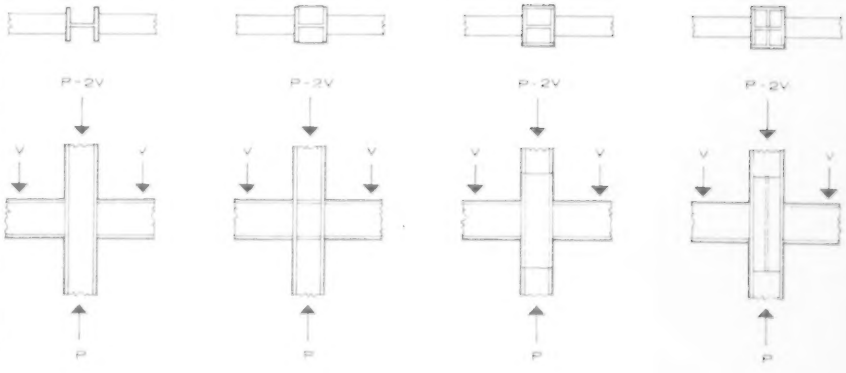
which will maintain good mechanical and chemical properties over a wider range of temperatures. These characteristics are the domain of the metallurgists, who are constantly seeking better steels at lower prices.

With respect to research on structural applications, the American Institute of Steel Construction and others are sponsoring test programs to verify theoretical concepts and to determine the actual behavior of full-scale structures. Many of the projects have been under study for a number of years, such as the development of the "Plastic Design Theory", which was presented to the profession in 1959 at the same time that it was adopted as part of the AISC design specification. Studies in theory and tests are currently in progress on the extension of plastic-design concepts to multistory buildings and a better understanding of the behavior of beam-to-column moment connections in the plastic range.

A report of studies on "Welded Interior Beam-to-Column Connections" was made in the fall of 1959 in a bulletin published by the AISC. This research examined the need for stiffeners to transmit the moments and shears from beams to columns as shown **(23)**. More testing is planned for other types of connections usually found in practice, such as attaching beams to webs of columns, and attaching beams to the web and one flange as in a corner column of a building.

The results of studies sponsored by the AISC on the composite action of a rolled beam and concrete floor slab will soon be available to the architectural and engineering professions. Bridge engineers have been using this principle for several years, and research was needed to establish the criteria for its use in buildings, since they are concerned primarily with static loads. The number of shear connectors required for building applications are fewer than those presently required in bridge work. The application of this principle to building designs should result in thinner floors and more economical floor systems.

Research is also under way to determine better methods of designing plate girders with thinner webs while maintaining desired factors of safety.



BEAM TO COLUMN CONNECTIONS

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Effect on Future Architecture

Architects will be in a better position to express their creative thinking in terms of steel when more knowledge on the use and economies of steel structures is obtained and made available to them. With

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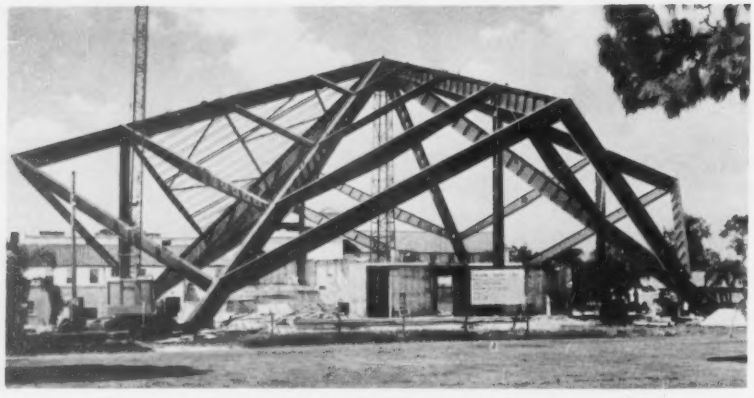

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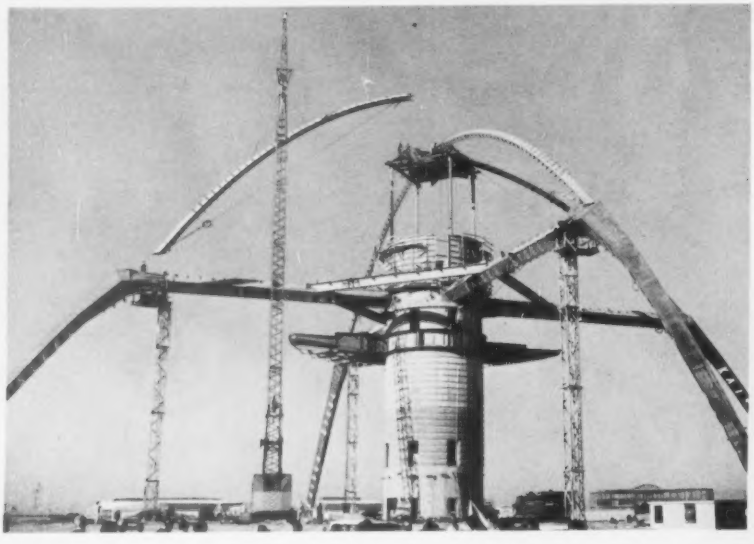

27

this freedom of action in thought and confidence in construction, the architect can be expected to give his creative talents free rein. Evidence of this may already be seen across the country. As an example, four hyperbolic paraboloids form the structure for a drive-in restaurant in Springfield, Missouri **(24)**. The membrane forces are carried by two layers of corrugated sheet that are placed perpendicular to each other. The edge loads are carried by lightweight sections. This unique structure serves as an illustration of the versatility which may be achieved by using steel for plastic expression.

Architects can feel free to design structures requiring a three-dimensional framework and know that the problem of making oblique connections is not insurmountable. Modern shop and field methods of welding and bolting have made possible many connections which were previously considered difficult.

The imaginative combination of cables and steel frames is producing structures with geometrical patterns which were considered impossible a few years ago.

Using the several strength levels of steel combined with the new techniques of fabrication and erection, many interesting forms are now possible, such as folded plates or folded-plate effects, domes, and varied shapes and sizes of roofs. The versatility of steel meets the needs of the architect by providing an economical framing material to suit practically all structures —a church with a folded-plate roof **(25)**, an eating shelter with a conoid covering **(26)**, a theme building for an airport having parabolic, diamond-shaped structural-steel arches **(27)**, an ellipsoidal-type community water tower **(28)**, and radial roof framing for an exhibition building **(29)**. The architect now has at his disposal the complete means to create distinctive structures.

(For architectural and photographic credits, see p. 280)

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Erecting a pre-engineered truss frame with a 90-ft span.

FLEXIBILITY IN STANDARDIZATION

BY PAUL S. BUKER

Pre-engineered structural systems need no longer produce the featureless, standardized buildings for which they were known in the past. Ingenuity and mass-production methods have created systems of standardized components which permit great latitude in building design. In the hands of the sensitive architect, these systems can yield quite satisfactory, if not monumental, buildings. On these pages Paul S. Buker, Chief of Building Design for Armco Drainage & Metal Products, Inc., and a registered architect, discusses the characteristics of one system and explains how computer methods have been applied in the refinement of its design.

The science of mass production is emerging today as a dynamic new influence in building technology. Its scope includes the full range of the building process, from component fabrication to field assembly. Its contributions are factory precision, quality, and quite considerable economy.

Although some still consider industrialization anathema, feeling that it stifles creativity, designers who accept its discipline and harness it with imagination will find that it offers ample flexibility. The result can be coherent, attractive design at otherwise unattainable savings.

Industrialization is having a most significant impact on pre-engineered steel construction. It has permitted economical standardization of a wide variety of framing and covering components, and made more accurate structural analysis possible. With these advantages, the volume of pre-engineered construction has increased to about $1 billion a year.

Industrialization is actually "revolutionizing" traditional principles of pre-engineering. The successful application of high-speed machinery is replacing the old concept of "off-the-shelf" standard buildings with a highly flexible system of standard modular parts that offer substantial freedom of design. The term "standard building" now serves primarily as a reference to identify the pre-engineered system. It relates parts to each other and to the structure as a whole; otherwise the task of identifying and cataloguing all components would be impossible.

In our rigid-frame system, for instance, components are mass-produced for 13 basic clear-span widths ranging from 16 to 120 ft, seven wall heights from 8 to 24 ft, four length modules, and four loading conditions. Self-framing and truss-frame systems add more components to the catalogue, and beyond these there are roof and wall coverings in a number of textures, finishes, and colors.

Computer Cuts Design Time

Industrialization also demands streamlining of engineering computations. Again, the rigid-frame building is a case in point: this structure is indeterminate to the first degree and, in our application, it has a

variable I cross-section. Optimum design is accomplished by repeated analysis, modification, and reanalysis of redefined frames.

By conventional methods, the calculations are voluminous. For example, the moment of inertia must be computed at numerous positions around the frame in order to evaluate the elastic frame value. One method for the calculation of moment of inertia requires eleven operations: three subtractions, seven multiplications, and one division. This repetition is simple but time-consuming.

Approximately 40 man-desk-calculator hours would be required to produce manually an accurate analysis of one rigid frame. Even a less detailed two-phase approach of rough estimates followed by more precise calculations would take 12 man-hours. And this would not include a neat, organized, reproducible format of results. The time factor involved in the manual sytem would also minimize the number of analyses accomplished for the purpose of minimizing weight and standardizing components. After the basic engineering analysis is completed, there remains the problem of computing plate lengths and cut-off angles, and preparing shop fabrication drawings.

To mechanize all of these calculations, we have programed our rigid-frame analysis for the IBM 7090 computer. In six seconds, this machine delivers a complete structural analysis of a rigid-frame bent and checks its own work. In two seconds, another computer program provides the exact weights, angles, and dimensions of parts and assemblies for detailed shop drawings.

The method of least work is employed to evaluate the indeterminate horizontal reactions for dead, live, and wind loads. Axial and bending stresses are printed, with their percentages of the allowable working stresses, for all standard combinations of dead, live, and wind loads. Allowable stresses are generated by the computer from formulas of the AISC.

To determine critical design stresses, dead, live, and wind loads are added in all probable combinations. These include dead and live or wind; dead, live, and half wind; and dead, wind, and half live. The latter two combinations are based on the improbability of full wind and full snow occurring at the same time. All points around the frame are checked for each combination because the critical combination at one point may not be governing at another point. Other load combinations, including significant superimposed concentrated loads dictated by individual projects, are satisfied by substituting a standard frame that has been analyzed for higher unit loads.

The rigid-frame analysis represents our largest computer project in size, scope, and application. Full-scale frames have been tested in the laboratory and show close correlation between actual and computed values. With the computer method, the engineer's time is given only to selecting sections, preparing input data, and reviewing results. Slide-rule calculations are limited to estimating proposed changes in previously analyzed frames.

Use of a computer program materially increases the flexibility of the building system and also permits refinement of designs to yield minimum weights. Once the computer program is written, rigid-frame analysis can be run for little cost. The computer program contains approximately 5600 instructions, plus sub-routines, and has the flexibility to permit analysis of gable frames of any roof pitch. Obviously, not all of the instructions are performed in generating each analysis, the number depending on the conditions of the problem. For instance, if the wind load is applied to the vertical projection instead of the wall, only those instructions pertaining to that specific condition are performed.

Minimizing Weight

Much attention is focused on the techniques of weight minimization, the elimination of material that does not contribute to integrity of the structure. For example, a simply supported beam will fail when the extreme fiber stress at the center of the span exceeds the elastic limit, even though there is still much metal not stressed to its ultimate potential. On the other hand, a continuous beam of considerably less weight designed for the same loading condition will carry its load through a combination of both positive and negative bending. Our purlin system, by combining continuity with extra net section over supports, permits a sizeable reduction of metal. Simply supported purlins would require approximately 22 per cent more steel to carry the same load.

Further reduction in weight is achieved by eliminating punches from the flanges of structural members. This practice permits further utilization of the most efficient part of the structural member. We were unable to take full advantage of this practice until the development of the high-tensile-strength bolt, and its acceptance by building authorities. When our design was modified to take advantage of this technical advance, the number of bolts required to assemble a typical rigid frame was reduced from 54 to 22, and the flanges of the frames developed more nearly their full potential strength. The savings resulting from the reduction in the number of bolts, as well as the weight of the sections, were substantial.

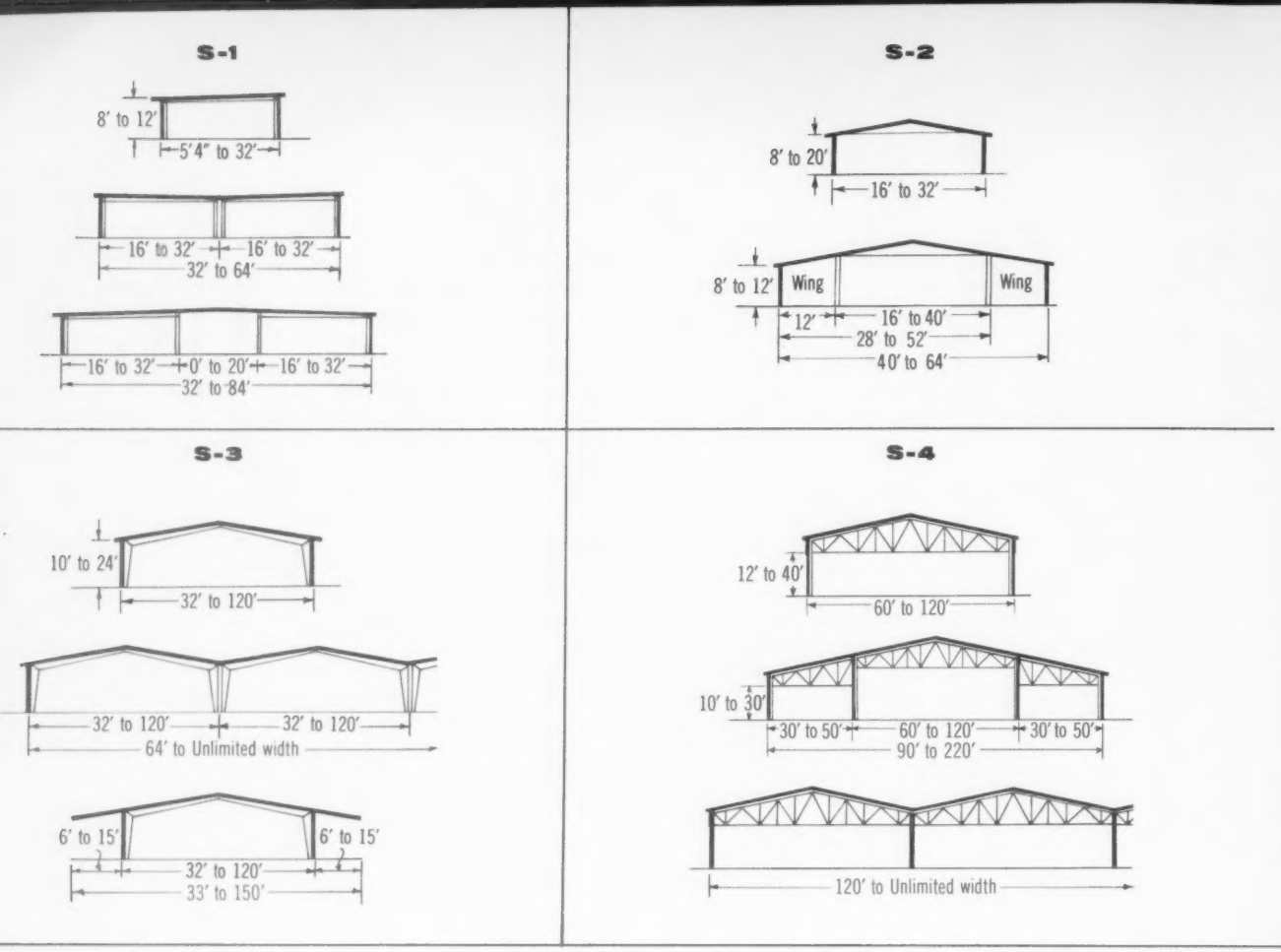
As computer technology advances, further possibilities for mechanizing design and production are anticipated. It is hoped that computers soon will be able to handle additional operations: calculation of costs and weights; making bills of material; inventory control, to include production scheduling, shop work orders, purchasing, and forecasting; preparation of price lists and parts catalogues; and sales analysis.

The result of these computer developments will, of course, continue to lower the cost not only of engineering but also of manufacturing, distribution, and administration.

Flexibility in Manufacturing Process

The high productivity of roll-forming equipment is a benefit sought by engineers and production men at every opportunity. The roll-forming process starts with a coil of steel. By continuously passing the material between successive pairs of rolls, a flat strip is shaped into a structural unit. Roll-forming equipment must, of course, be operated at a large volume to be economical.

Our purlins, roof panels, and wall panels are roll-formed. The length of each may be controlled by simple adjustment of cut-off shears. Because these parts comprise such a large portion of each building, they need not be inventoried. Roll-forming equipment, operating at 5 to 7 ft per second, is flexible enough to provide wall and roof covering of various specified lengths. Roof-panel overhang and curb-wall situations, optional with our building system, are handled in this fashion. Rolls may be fashioned to manufacture a wide variety of shapes. However, a completely integrated line which produces the finished part, including punching and painting, does not generally have flexibility be-



yond gage, length, hole pattern, and grade of steel.

Roof purlins, for example, make an integrated line feasible, because there is enough production required to keep this equipment busy. Purlins, which have a constant cross-section 6 in. deep and 2½ in. wide, can be selected from any one of four gages of coil stock. By adjusting the cut-off shear, purlins can be mass-produced for 16-, 20-, and 24-ft bays with any of four loading conditions.

A Flexible System of Coverings

Our basic wall material is the roll-formed steel panel, 16 in. wide with two 3-in. ribs, combining structural support and enclosure in one unit. It is available in zinc-coated or aluminum-coated steel, and also in a variety of factory-applied colors. At any point in the wall, complete wall panels may be omitted without affecting the structural integrity of the remainder of the building. An insulated liner panel built to the same module as the wall panel is also a self-sufficient unit. The wall panels are fastened with bolts, installed entirely within the building for better appearance and safety.

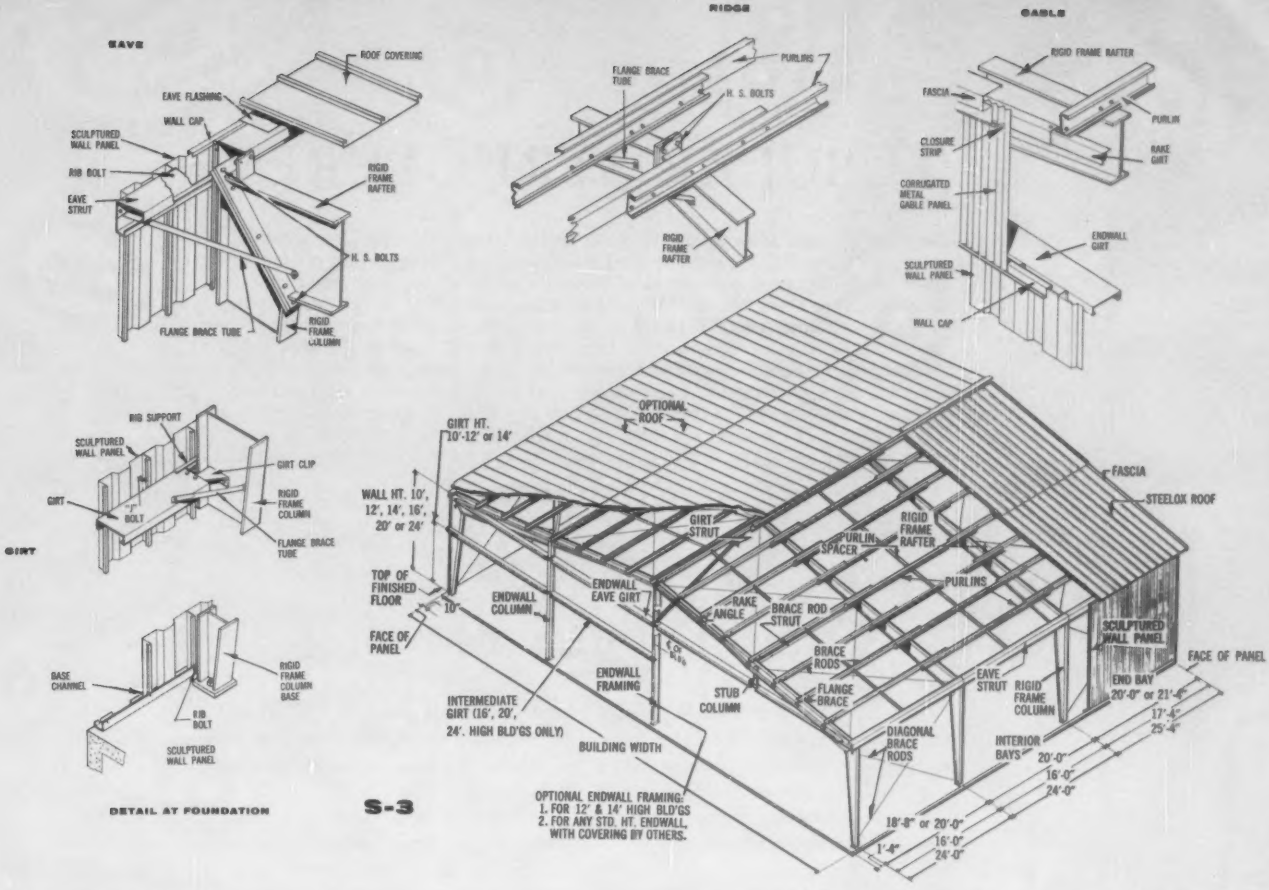
On framed buildings with wall heights up to 14 ft, panels frame from the foundation to the eave of the building without intermediate structural support. Window and door framing is built into the panels and is independent of structural framing. Therefore, openings may be located on any 16-in. module by simply substituting window and door units for steel panels.

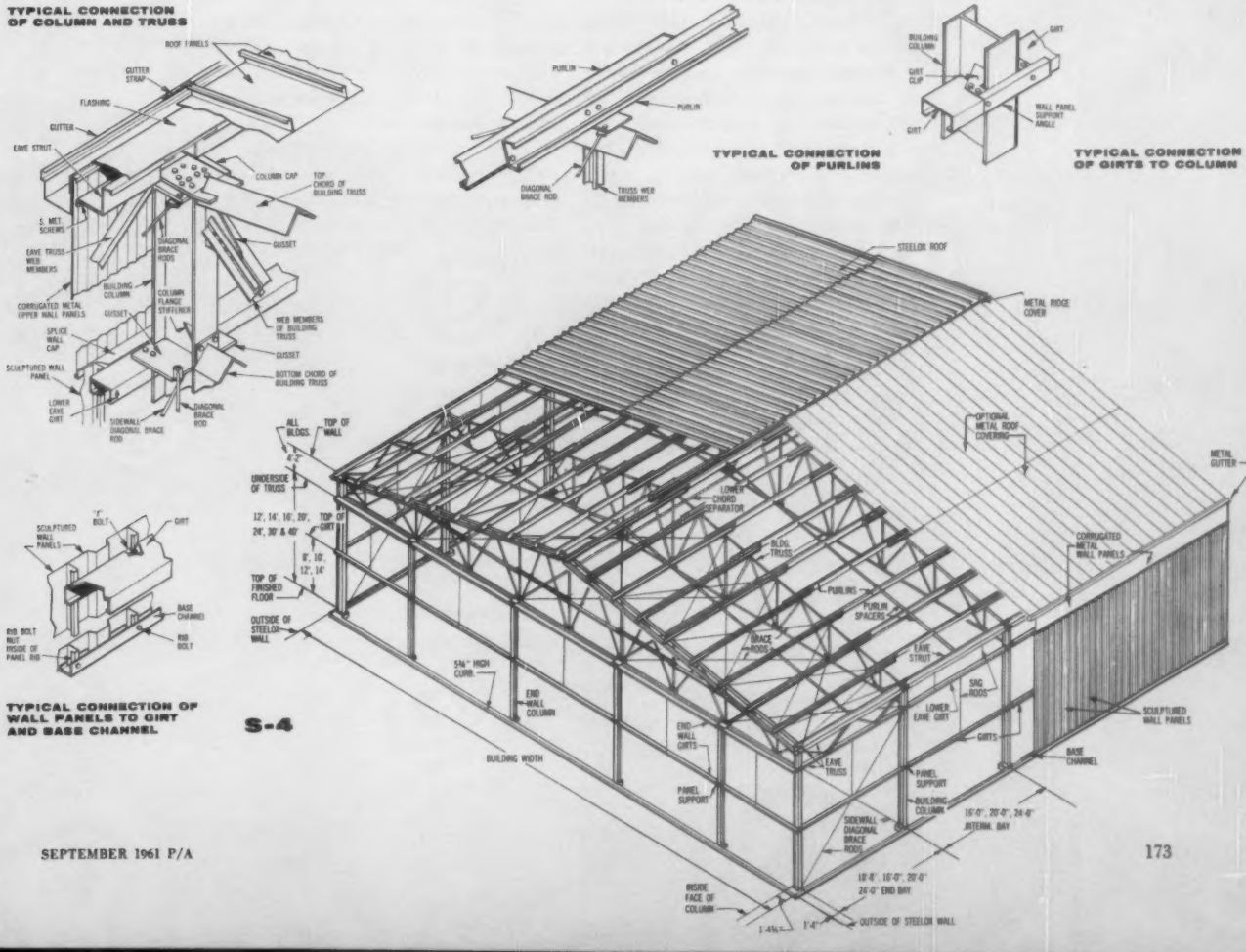
The modular approach makes the use of contrasting materials simple and natural. Designers may blend standard steel panels with glass, masonry, brick, tile, or other materials. This flexibility in the modulation of pierced openings and contrasting materials is carefully preserved throughout the component system.

Common accessories, such as windows and doors, partitions and ceilings, skylights, and gutters and downspouts, are provided by the manufacturer. Appropriate design allowances are made for certain accessory items that are not part of the structural system. For example, craneways, chimneys, and overhead doors may be safely and economically added to the larger rigid-frame and truss systems.

A Look Ahead

The increasing influence of industrialization on the building industry is well recognized. Designers, suppliers, and builders are constantly looking for new approaches to building technology. But despite the great strides that have already taken place, construction is still a frontier virtually untouched by mass-production methods. Significant progress lies ahead for those who systematically question every phase of the building process, search for new ways to industrialize, improve quality, cut costs and, at the same time, provide maximum freedom of expression.


EAVE
ROOF COVERING
EAVE FLASHING
WALL CAP
SCULPTURED WALL PANEL
RIB BOLT
EAVE STRUT
RIGID FRAME RAFTER
H. S. BOLTS
FLANGE BRACE TUBE
RIGID FRAME COLUMN
RIDGE
FLANGE BRACE TUBE
PURLINS
H. S. BOLTS
RIGID FRAME RAFTER
GABLE
RIGID FRAME RAFTER
FASCIA
PURLIN
CLOSURE STRIP
RAKE GIRT
CORRUGATED METAL GABLE PANEL
ENDWALL GIRT
SCULPTURED WALL PANEL
WALL CAP
GIRT
RIB SUPPORT
SCULPTURED WALL PANEL
GIRT CLIP
GIRT
"J" BOLT
RIGID FRAME COLUMN
FLANGE BRACE TUBE
BASE CHANNEL
RIGID FRAME COLUMN BASE
RIB BOLT
SCULPTURED WALL PANEL
DETAIL AT FOUNDATION
S-3
OPTIONAL ROOF
GIRT HT. 10'-12' or 14'
WALL HT. 10', 12', 14', 16', 20' or 24'
TOP OF FINISHED FLOOR
10'
FACE OF PANEL
ENDWALL COLUMN
ENDWALL EAVE GIRT
GIRT STRUT
PURLIN SPACER
RIGID FRAME RAFTER
PURLINS
RAKE ANGLE
BRACE ROD STRUT
BRACE RODS
FLANGE BRACE
STUB COLUMN
ENDWALL FRAMING
INTERMEDIATE GIRT (16', 20', 24'. HIGH BLD'GS ONLY)
BUILDING WIDTH
OPTIONAL ENDWALL FRAMING:
1. FOR 12' & 14' HIGH BLD'GS
2. FOR ANY STD. HT. ENDWALL, WITH COVERING BY OTHERS.
FASCIA
STEELOX ROOF
SCULPTURED WALL PANEL
FACE OF PANEL
END BAY 20'-0" or 21'-6"
17'-4"
25'-4"
EAVE STRUT
RIGID FRAME COLUMN
INTERIOR BAYS 20'-0" 16'-0" 24'-0"
DIAGONAL BRACE RODS
18'-8" or 20'-0" 16'-0" 24'-0"
1'-4"


TYPICAL CONNECTION OF COLUMN AND TRUSS
ROOF PANELS
GUTTER STRAP
FLASHING
GUTTER
EAVE STRUT
COLUMN CAP
TOP CHORD OF BUILDING TRUSS
S. MET SCREWS
EAVE TRUSS WEB MEMBERS
DIAGONAL BRACE RODS
GUSSET
CORRUGATED METAL UPPER WALL PANELS
BUILDING COLUMN
COLUMN FLANGE STIFFENER
SPLICE WALL CAP
WEB MEMBERS OF BUILDING TRUSS
SCULPTURED WALL PANEL
BOTTOM CHORD OF BUILDING TRUSS
LOWER EAVE GIRT
SIDEWALL DIAGONAL BRACE ROD
PURLIN
PURLIN
DIAGONAL BRACE ROD
TRUSS WEB MEMBERS
TYPICAL CONNECTION OF PURLINS
BUILDING COLUMN
GIRT
GIRT CLIP
WALL PANEL SUPPORT ANGLE
GIRT
TYPICAL CONNECTION OF GIRTS TO COLUMN
"J" BOLT
GIRT
SCULPTURED WALL PANELS
BASE CHANNEL
RIB BOLT NUT INSIDE OF PANEL RIB
RIB BOLT
TYPICAL CONNECTION OF WALL PANELS TO GIRT AND BASE CHANNEL
S-4
STEELOX ROOF
METAL RIDGE COVER
OPTIONAL METAL ROOF COVERING
METAL GUTTER
ALL BLDGS. TOP OF WALL
4'-2"
UNDERSIDE OF TRUSS
12', 14', 16', 20', 24', 30' & 40'
TOP OF GIRT
8', 10', 12', 14'
TOP OF FINISHED FLOOR
OUTSIDE OF STEELOX WALL
LOWER CHORD SEPARATOR
BLDG. TRUSS
PURLINS
PURLIN SPACERS
BRACE RODS
EAVE STRUT
5½" HIGH CURB
END WALL COLUMN
SAG RODS
LOWER EAVE GIRT
CORRUGATED METAL WALL PANELS
SCULPTURED WALL PANELS
END WALL GIRTS
GIRTS
BASE CHANNEL
EAVE TRUSS
PANEL SUPPORT
PANEL SUPPORT
BUILDING COLUMN
BUILDING WIDTH
SIDEWALL DIAGONAL BRACE RODS
16'-0", 20'-0", 24'-0" INTERIA BAY
18'-8", 16'-0", 20'-0" 24'-0" END BAY
INSIDE FACE OF COLUMN
1'-4½"
1'-4"
OUTSIDE OF STEELOX WALL

TUBULAR STRUCTURES

Although all major steel producers in the United States offer steel-pipe sections, it remains a material infrequently used in building construction. A tour of Europe, however, would reveal a wide use of tubular steel in all forms of architectural and structural applications. The relatively small selection of available tube sizes, and enigmas associated with welding, have been given as reasons for the scant use of tubular construction here. Nevertheless, observers report that architects are eager to learn more concerning the potentials of this structural material. Unfortunately, there has been a lack of good technical literature and almost no promotion. The prediction is that steel-pipe construction will gather substantial momentum in the next few years. To illustrate some of its uses both here and abroad, an apartment house, a factory, and a chapel are presented.

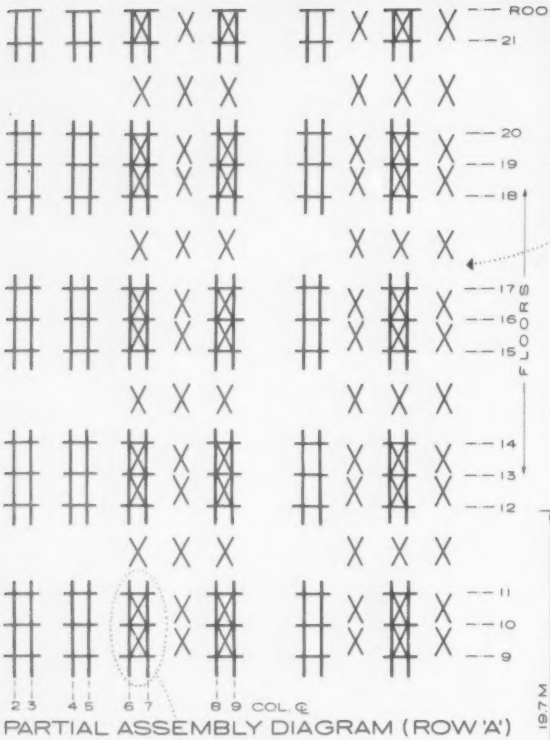
APARTMENT HOUSE

Total Tubular Framing

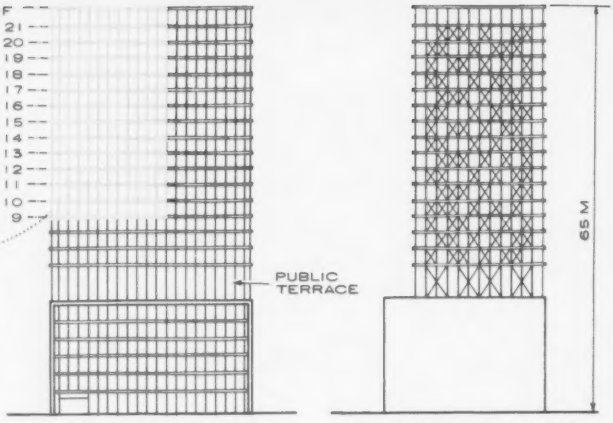
As a result of comparative studies of various structural systems, a steel-pipe frame was selected as being most economical for a multistory apartment building erected in Paris. A description of this structure's design and erection is presented.

One of the most recently completed apartment buildings in Paris, a 22-story *gratte ciel* at 33 Rue Croulebarbe, has a framing system in which all of its columns and cross-bracing members are of tubular steel. Although most contemporary designers enclose their multistory structures with a curtain-wall sheathing, Architects E. Albert, R. Boileau, and J. Henri-Labourdette chose to reveal externally the unusual framing of this building. As a result of numerous studies of comparative framing schemes with J. L. Sarf, Consulting Engineer and enthusiastic proponent of tubular framing, a steel-pipe design was adopted.

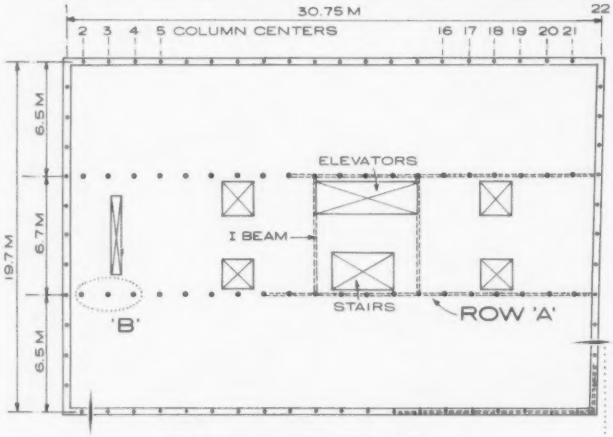
As has long been known, all columns tend to fail in the direction perpendicular to the axis about which the moment of inertia is least. Since the most efficient cross-section of a column is one having equal moments of inertia about any axis through its center of gravity, a hollow-pipe most nearly approaches this ideal section. By filling such pipes with concrete, as was done at the Rue Croulebarbe building, a mixed material of high efficiency is created, while a reduction in noise transmission—a potential source of annoyance with tubular construction—is simultaneously effected.



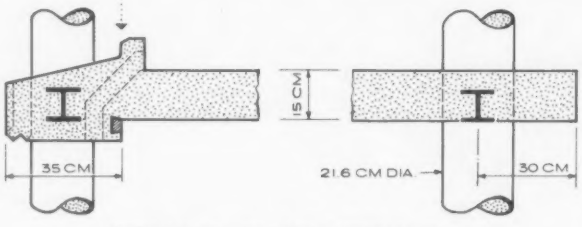
PARTIAL ASSEMBLY DIAGRAM (ROW 'A')



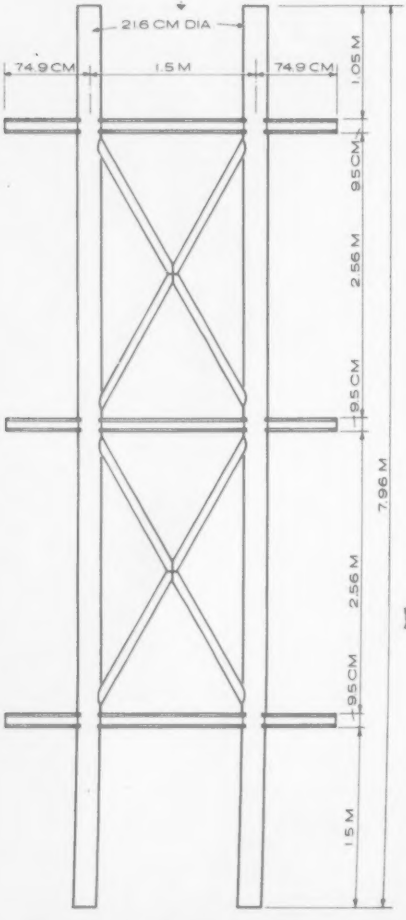
MAIN ELEVATION BRACED FACADE



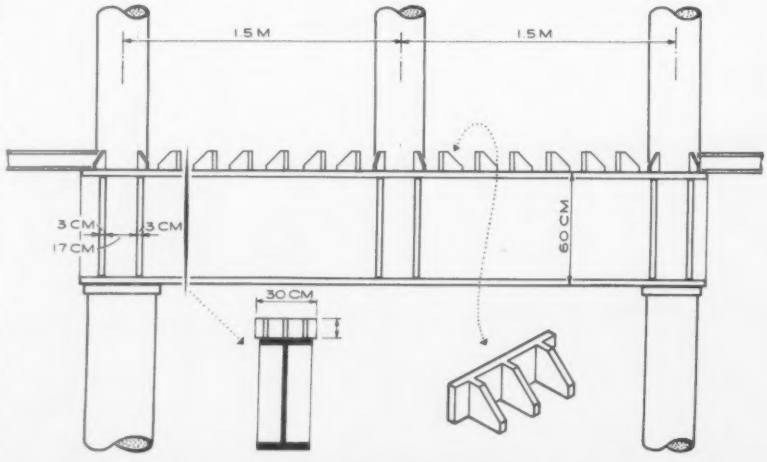
TYPICAL FLOOR PLAN



COLUMN SLAB DETAILS



TYPICAL PIPE PANEL



LINTEL DETAIL OVER ENTRY 'B'

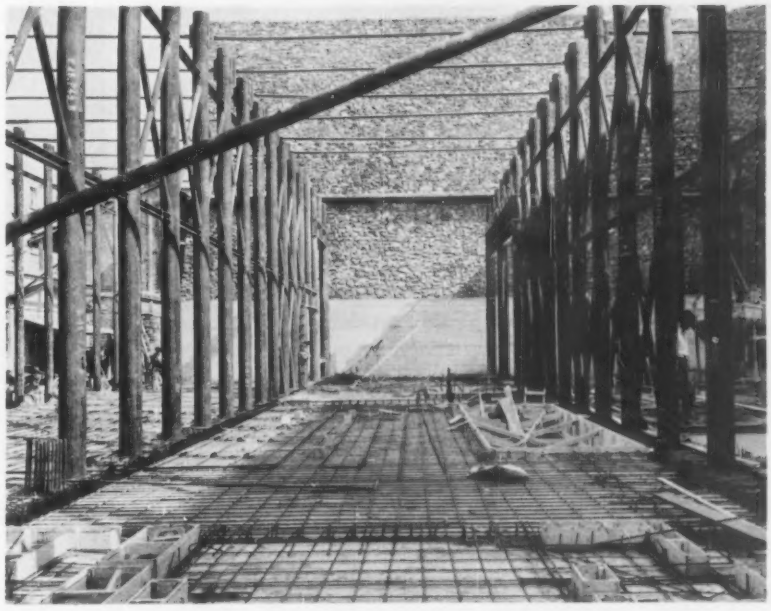
To support the apartment tower, which is approximately 100 ft long, 65 ft deep and 213 ft in height, 7½-in. diameter pipes were selected for the periphery of the building, while 8½-in. diameter members were chosen for the interior two rows of columns. In determining the diameters and thicknesses of the pipes, the concurrent co-action of the concrete and steel was taken into account. Calculations revealed the weight of a filled tube to be less than the total weight of an unfilled tube, had one been selected for the required loading. The 5-ft module established for the column lines provided a small bay with remarkable capacity. Concrete slabs, 6 in. thick and reinforced with welded-wire fabric, were poured between the core and perimeter columns. A secondary horizontal structure is made up of 4-in. wide-flange structural shapes separating the columns. The 5-ft span of these shapes permitted a substantial reduction in the total weight of the beams required to support the concrete floor slab.

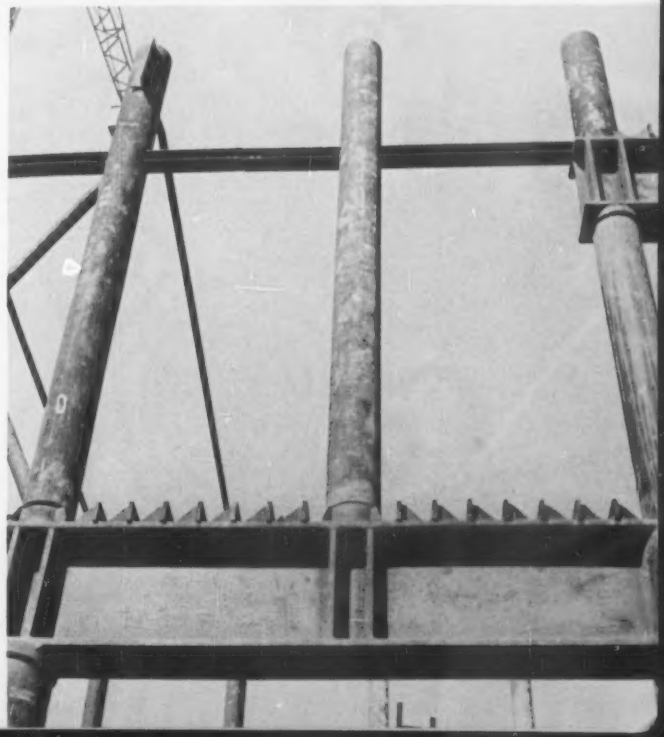
The structure as a whole was designed to absorb lateral wind loads. These stresses are transferred from the façades via the floors to the longitudinal wind-bracing walls at the interior of the tower, and to the wind-bracing façades in the transverse direction. The bearing walls and the wind-braced elevations in turn transfer these wind loads to the foundations. Cross-bracing, which strengthens the four wind-braced rows of columns, provides an immovable grille. The tubing in the cross pieces reportedly keeps horizontal sway far below that permitted by United States standards for multistory structures of this type.

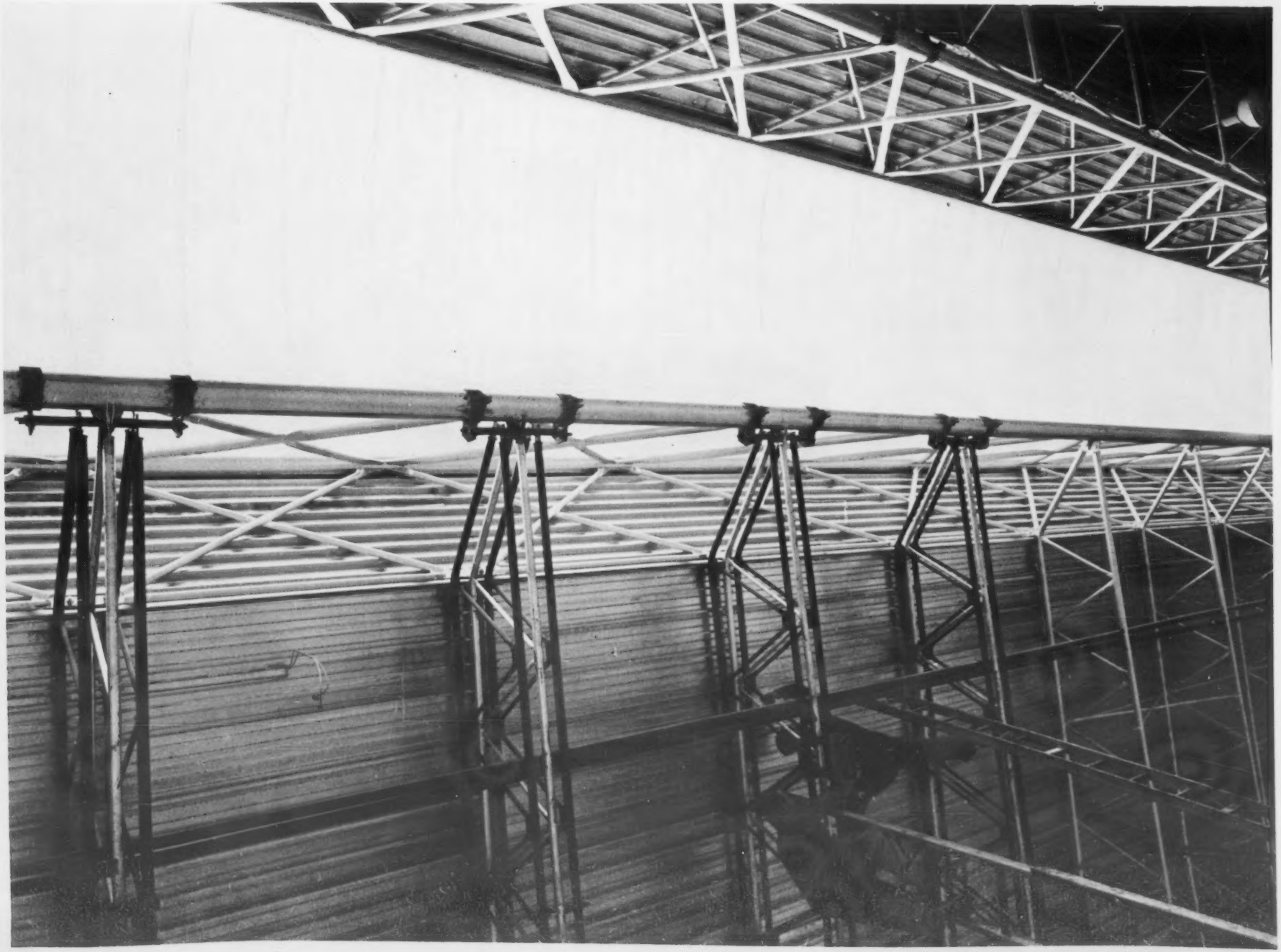
Erection proceeded as follows: two-story pipe panels composed of columns plus cross bracing and/or structural shapes (*see assembly diagram*) were cut, shop welded, and brought to the site, where they were temporarily held in position by means of tie rods while adjacent panels were welded together. Succeeding levels of the pipes were joined by telescoping joints and locking welds. Concrete floors, poured between façades and bearing walls, tie the structure together.

Total area of the tower is 13,941 sq m. Material quantities required for the structure were: 330 tons of steel pipe, 154 tons of structural shapes, 3791 cu m of concrete, and 293 tons of reinforcing steel. Cost of completed building (including an adjacent small building of 1682 sq m) was under 6,000,000 new French francs ($1,200,000), thus establishing the economic validity of its framing concept. Without this rational utilization of steel tubing, the cost would undoubtedly have been much higher.

Detail of bracing at upper public terrace (right). *Interior wind-bracing columns* (center), *enclosing 22-ft-deep core, are held in place by tie rods until floor slabs are poured and next level of pipe panels is welded into position. Lintel over doorway takes concentrated load of an interior pipe column* (bottom, and in drawing acrosspage).







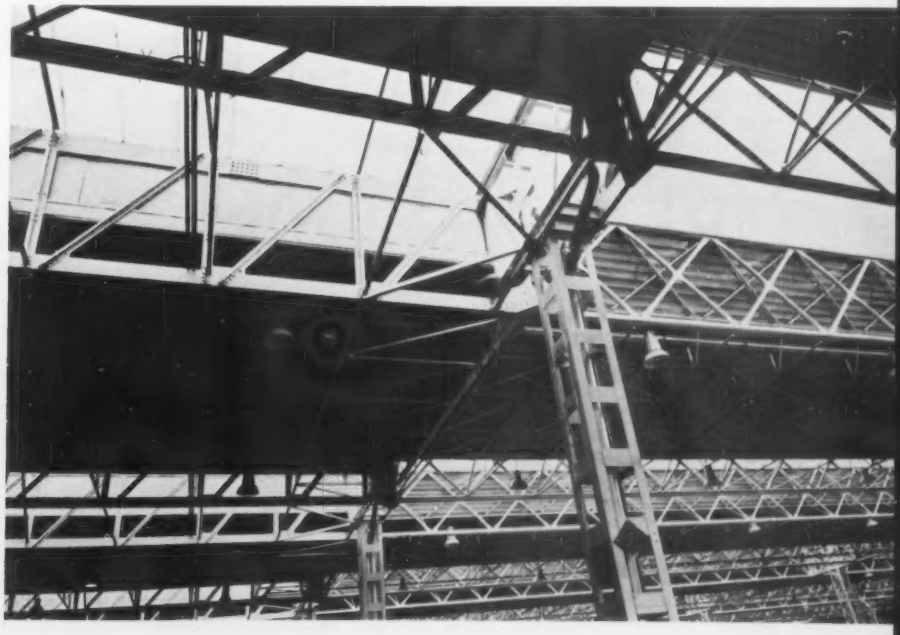
FACTORY

Long-Span Tubular Trusses

This framing system for an assembly plant, having bay areas of 4000 sq ft, was made entirely of tubular components. The flexibility of its design offers the architect a wide range of bay and monitor dimensions and at a cost that is competitive with other framing methods.

Cost-saving possibilities of tubular construction are strongly evident in industrial buildings. In such a structure, where utilitarian considerations are paramount, a principal argument for steel-pipe might be proven if it could be shown that its use is more economical than other framing systems. This was demonstrated in an addition to the Massey-Ferguson factory at Beauvais, France, designed by Architect M. Gridaine with Consulting Engineer J. L. Sarf. The original section of this tractor assembly plant was constructed of standard, rolled structural shapes (*left in photo below*). When expansion was planned—the expanded area became by far the greater area of the total structure (*see small-scale plan*)—tubular framing studies revealed the savings of such a system.

Primary roof elements of the framing are self-supporting tubular panels composed of two open-web trusses tied together by an appropriate system of tubular purlins and tie rods. These panels

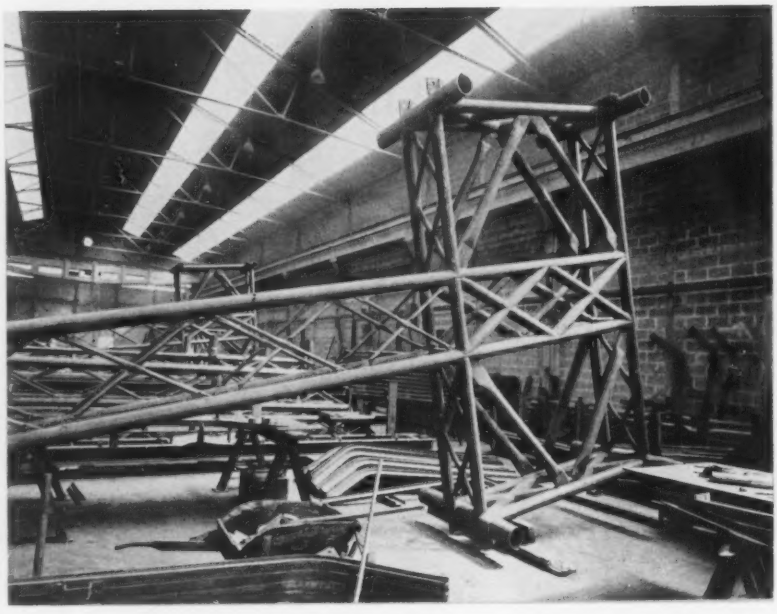


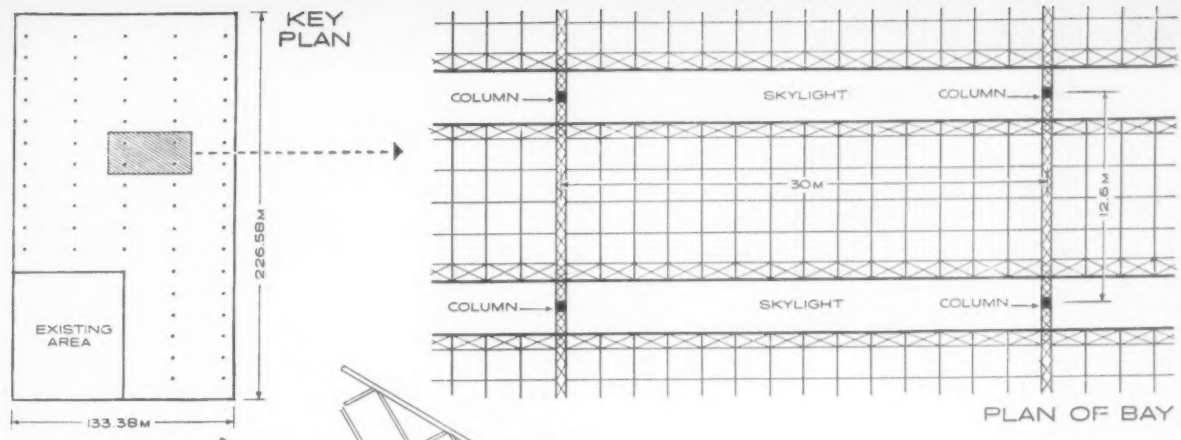
are topped with a metal roof deck and built-up roofing system.

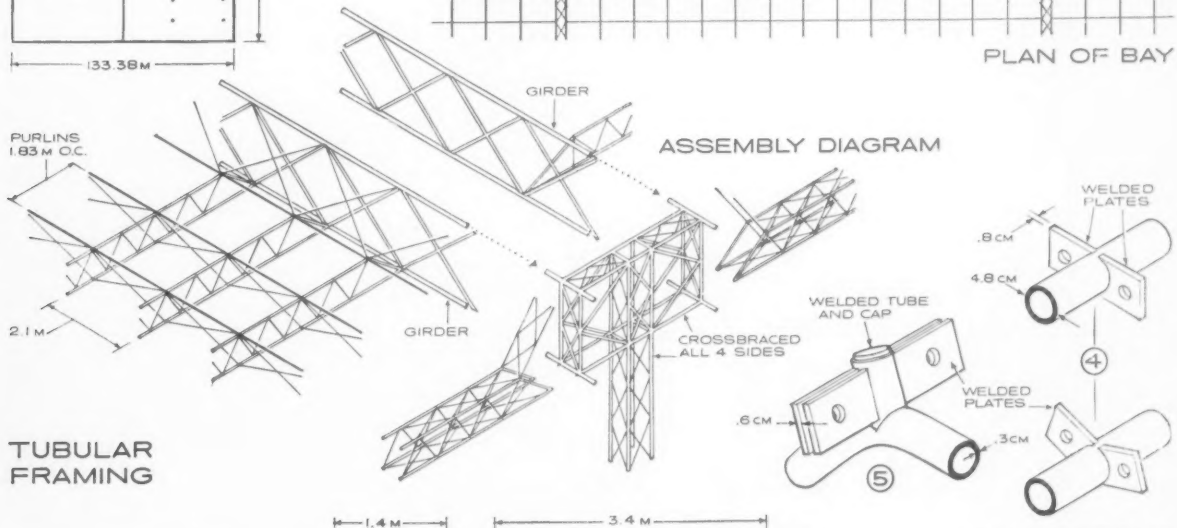
Composite tubular-steel columns, whose locations establish 40′ x 100′ bays, have cantilevered pipe brackets which support the site-assembled roof panels. Water from the roof panels flows to drain pipes, centered within the four-pipe columns, and is subsequently directed to a general sewer system.

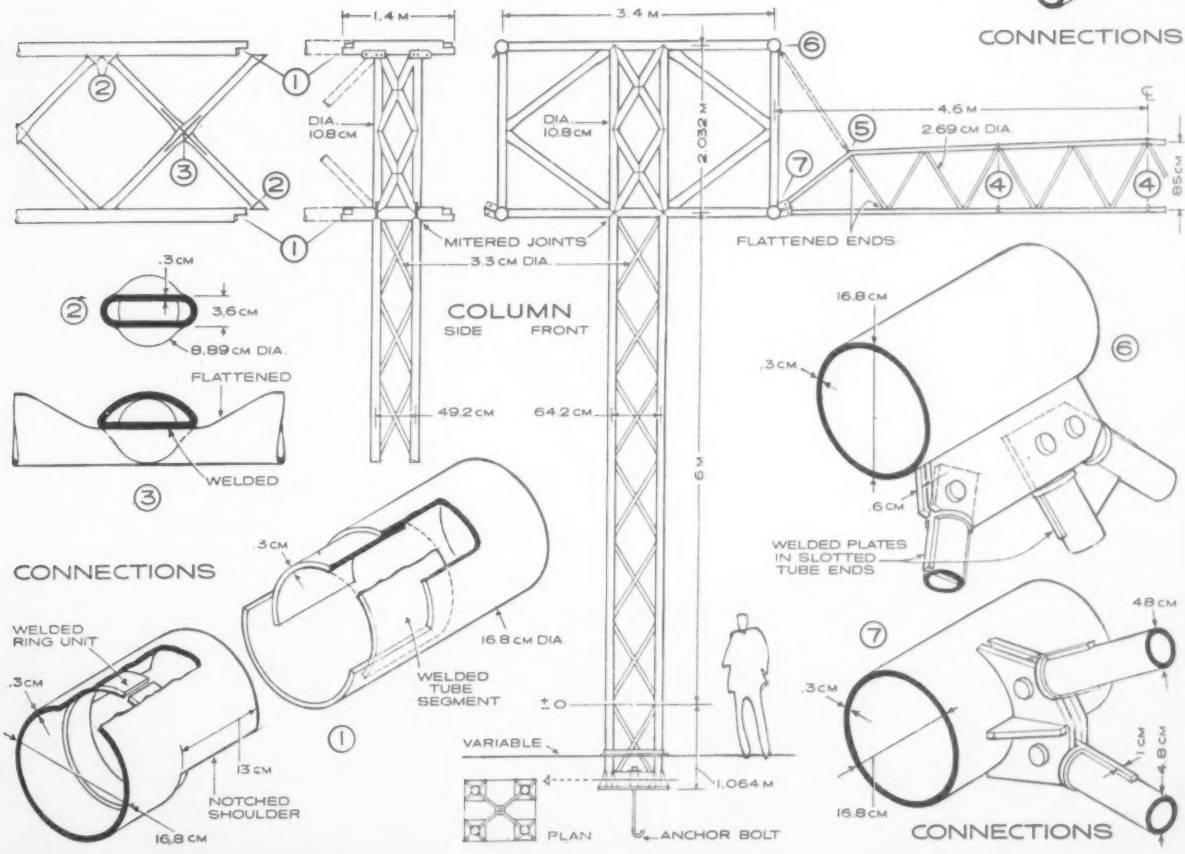
Monitors located between the cross-braced trusses are formed by translucent plastic vaults. During preliminary design, different widths of monitors were studied by varying the distance between adjacent self-supporting roof panels. Through such a study, it was found possible to avoid shaded areas at any location at floor level.

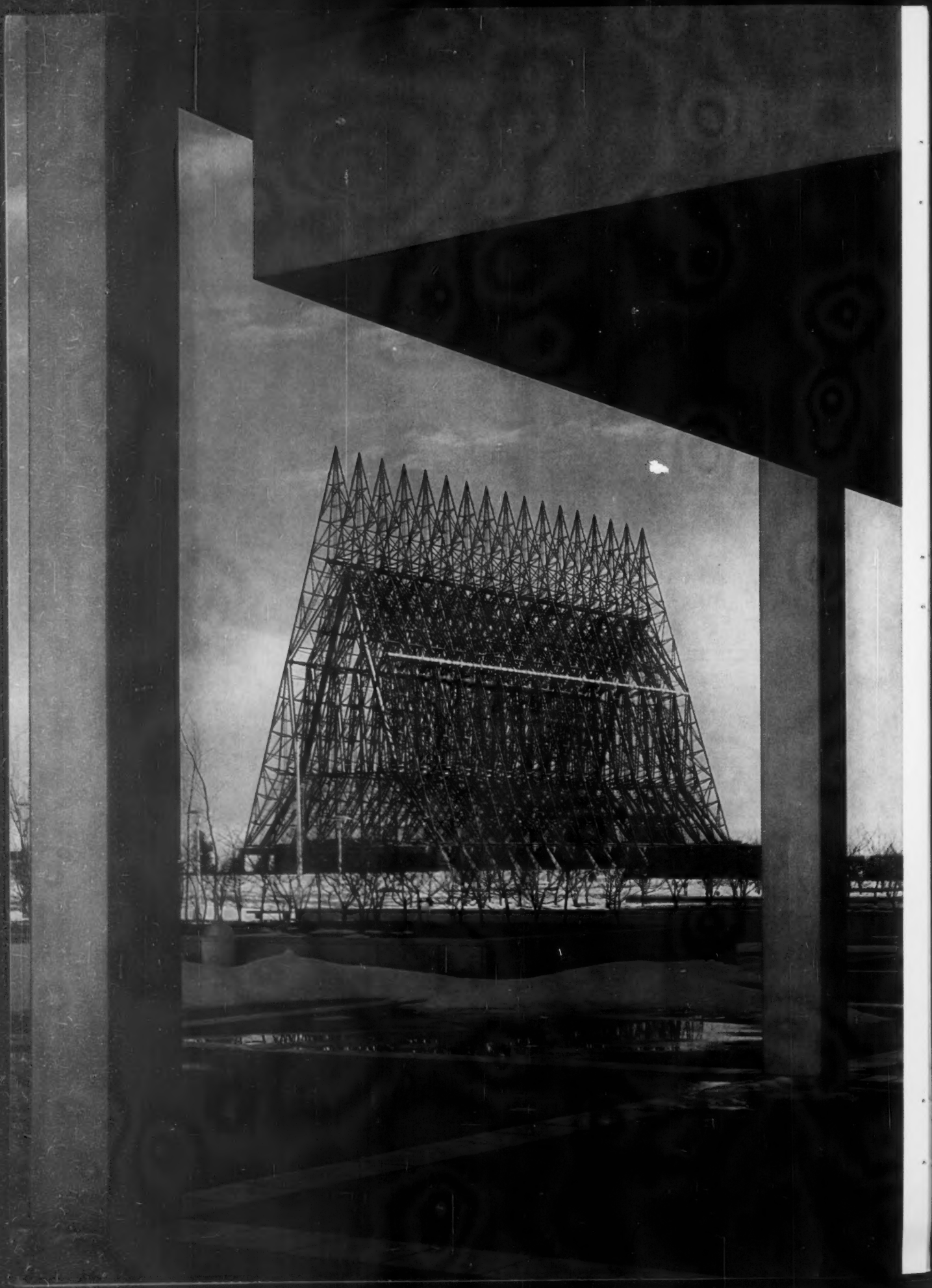
Industrial requirements frequently demand that relatively heavy loads be suspended from a factory's framing system. Studies for this plant showed that its pipe framing could easily be made to sustain required loading by the appropriate design of the welded open-web trusses. Larger spans, if required, could be obtained by increasing the depth of the trusses or by the use of prestressed cables set within the bottom chords of the trusses.




KEY PLAN
EXISTING AREA
226.58M
133.38M
COLUMN
SKYLIGHT
COLUMN
30M
12.6M
COLUMN
SKYLIGHT
COLUMN
PLAN OF BAY


PURLINS
1.83M O.C.
2.1M
GIRDER
GIRDER
ASSEMBLY DIAGRAM
CROSSBRACED
ALL 4 SIDES
WELDED TUBE
AND CAP
WELDED
PLATES
.8CM
4.8CM
WELDED
PLATES
.6CM
.3CM
TUBULAR
FRAMING
CONNECTIONS


1.4M
3.4M
DIA.
10.8CM
DIA.
10.8CM
2.032M
4.6M
2.69CM DIA.
.85CM
MITERED JOINTS
3.3CM DIA.
FLATTENED ENDS
.3CM
3.6CM
8.89CM DIA.
FLATTENED
WELDED
COLUMN
SIDE
FRONT
49.2CM
64.2CM
6.3M
16.8CM
.3CM
.6CM
WELDED PLATES
IN SLOTTED
TUBE ENDS
CONNECTIONS
.3CM
16.8CM DIA
WELDED
RING UNIT
.3CM
WELDED
TUBE
SEGMENT
±0
VARIABLE
13CM
NOTCHED
SHOULDER
16.8CM
1.064M
PLAN
ANCHOR BOLT
4.8CM
.3CM
1CM
4.8CM
16.8CM
CONNECTIONS



CHAPEL

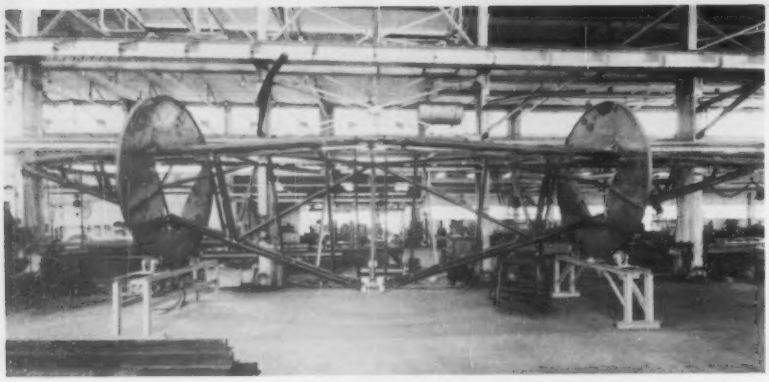
Tubular Tetrahedrons

Seventeen spires, rising almost 150' above ground level, top the Air Force's new chapel, which will be completed this year. An analysis of its tubular framing design and a summary of the related fabrication process are presented.

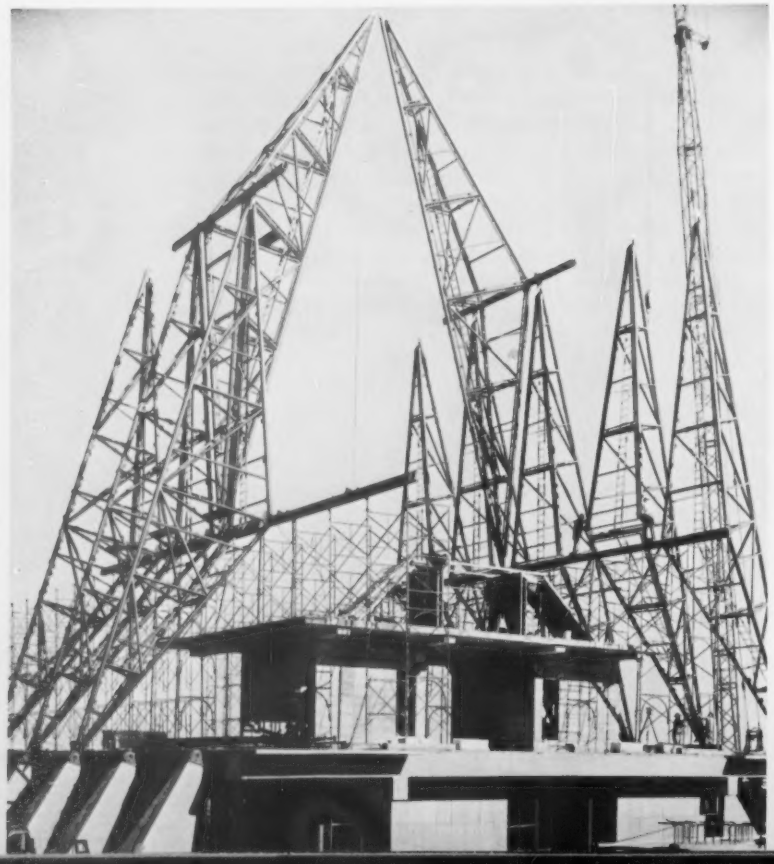
One hundred welded, tubular-steel tetrahedrons—plus 50,000 miscellaneous clips, girts, pegs, etc.—comprise the structural framing of the Air Force Academy Chapel at Colorado Springs designed by Architects-Engineers Skidmore, Owings & Merrill. Main tetrahedron chords and intermediate web members are 6 in. and 4 in. diameter pipe respectively. Space limitations within the exposed surfaces made it necessary to restrict structural shapes to a minimum size. Since the members in the tetrahedrons are subjected principally to concentric loads—mainly compression —a section providing maximum l/r in all directions is the most economical. The pipe section is best suited for such a condition. Selection of tubular-steel sections has the further advantage that welded joints at pipe intersections provide an easily joined and exceptionally rigid connection. The articulation of the structure as a whole made it mandatory to fabricate the units with maximum rigidity. At the end joints of the tetrahedrons, it was a relatively simple matter to cut slots in the pipes, insert gusset plates, locate them precisely, and weld for required strength.

A cost comparison of tubular steel with rolled sections indicated that the savings in unit cost of the rolled section were balanced by an increase in weight required. For all rolled sections in compression, the weak axis governs for l/r; that is, the material in the section cannot be utilized to its best advantage. Furthermore, in this design the connections for the rolled sections would have been difficult to make due to the inclined intersections. Space limitations also restricted the use of gusset connections, which would have been necessary in some locations to achieve the rigidity required.

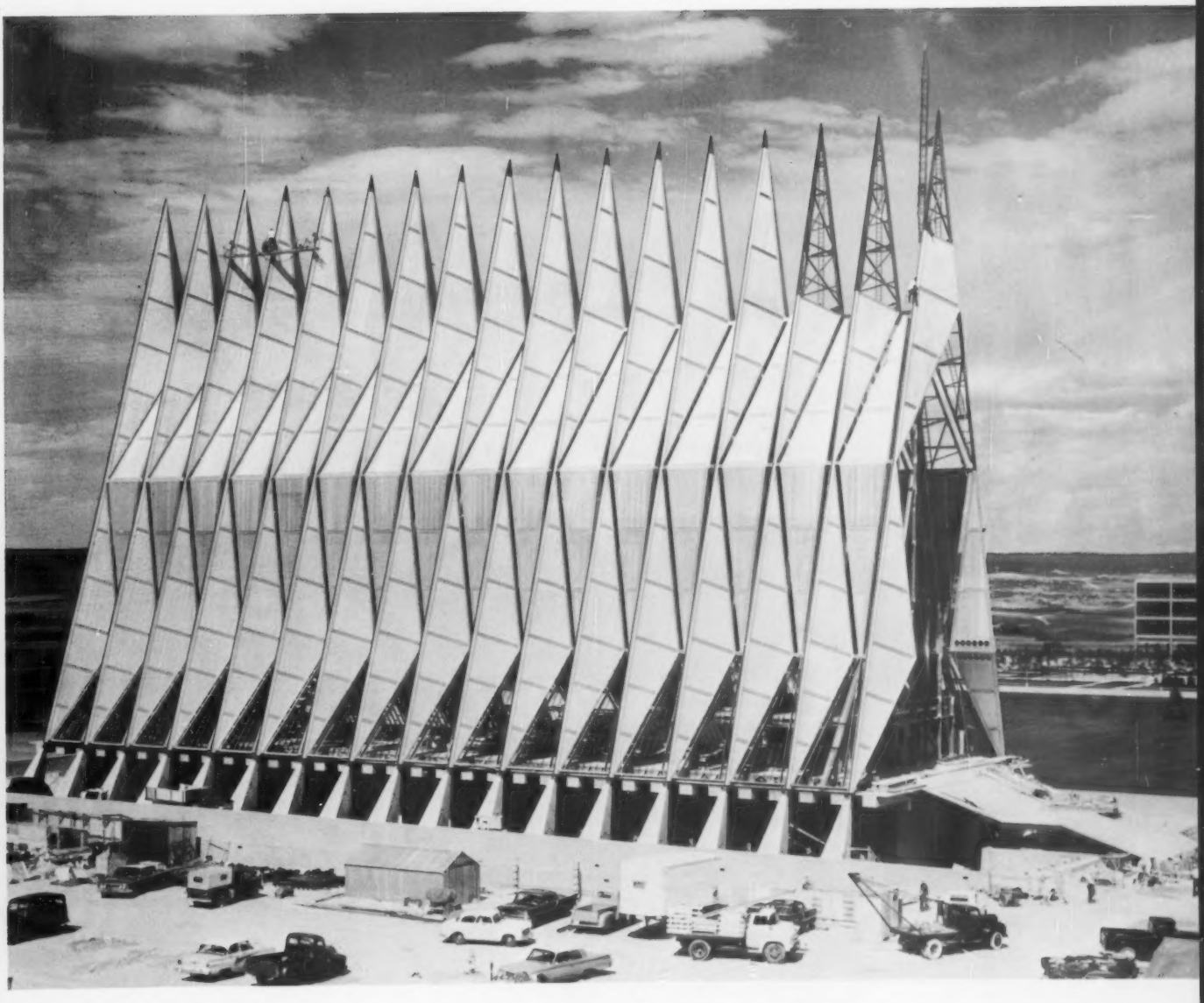
Rectangular horizontal struts were made of high-strength, "T-1" steel plates. Since the tetrahedrons are separated laterally by 2-ft-wide window strips, they do not directly transfer loads from one to another. The struts accomplish this task, as well as transferring the loads in bending. Struts are spliced on center lines of alternate tetrahedrons by full butt welds at points of minimum stress.



During fabrication process, large turning rings were attached to each end of tetrahedron enabling it to be rotated for down welding (above). *Ladders inside tetrahedrons* (right) *were useful in skin erection and assist subsequent maintenance.*



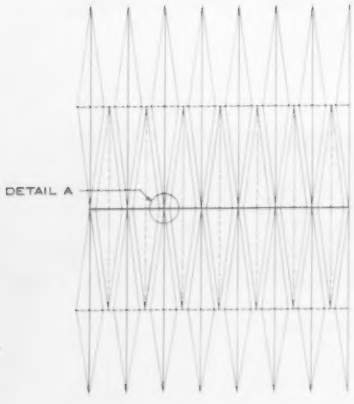
Shop detail drawings were made by employing a system of superposition, using up to 16 drawings for each tetrahedron. Shown on the drawings were the pipe frame, ladders and grating platforms, clips for exterior aluminum sheathing, girts, channel frames for plaster, and pegs for attachment of plastic separator sheets. The 4-in.-diameter pipe-ends were prepared by using a pipe-cutting pantograph. Bed rolls of this machine rotated the pipe while the travel of the burning torch (synchronized with the rotation) was controlled by an electric cam. In this manner, angular pipe framing contours were achieved accurately and easily. Pipe members of one face were placed in a full-size jig, and after tack welding, the assembly was rotated about the single edge common to two faces. Then the assembly and tack welding of the other face and remaining members took place. Following this as-



sembly, large turning rings, 12 ft in diameter, were fixed at each end of a tetrahedron and the entire unit was placed on turning rolls, which rotated it for down welding.

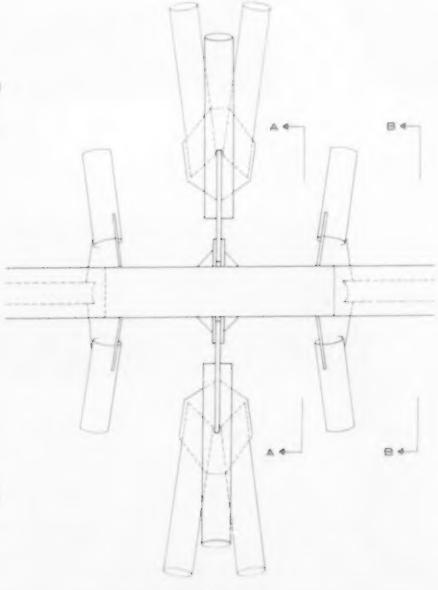
Following prefabrication, the tetrahedrons were shipped to the site by rail. To facilitate alignment during erection, pipe scaffolding was used. This scaffolding remained in position until erection was completed; in the final assembly, the top tetrahedrons were already in place to prevent deflection of the lower units. The 100 tetrahedrons, connection members, and end-wall framing were all hoisted in place and bolted, ready for field welding, in 89½ working hours. After erection, the tetrahedrons were surveyed and adjusted to exact positions before final welding of connections.

Andrew J. Brown, Chief Structural Engineer of SOM's Chicago office, was responsible for the structural design of the framing. Mississippi Valley Structural Steel Company was the fabricator.

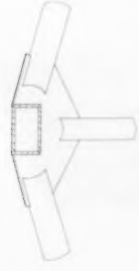


PARTIAL ELEVATION

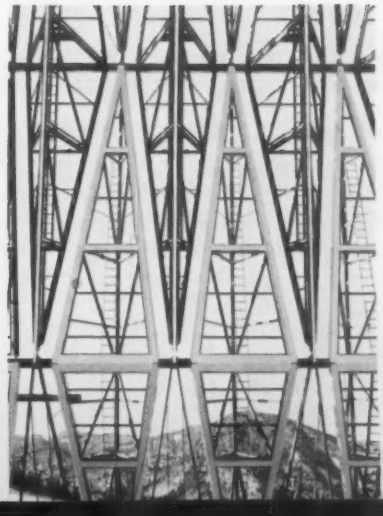
SECTION A-A



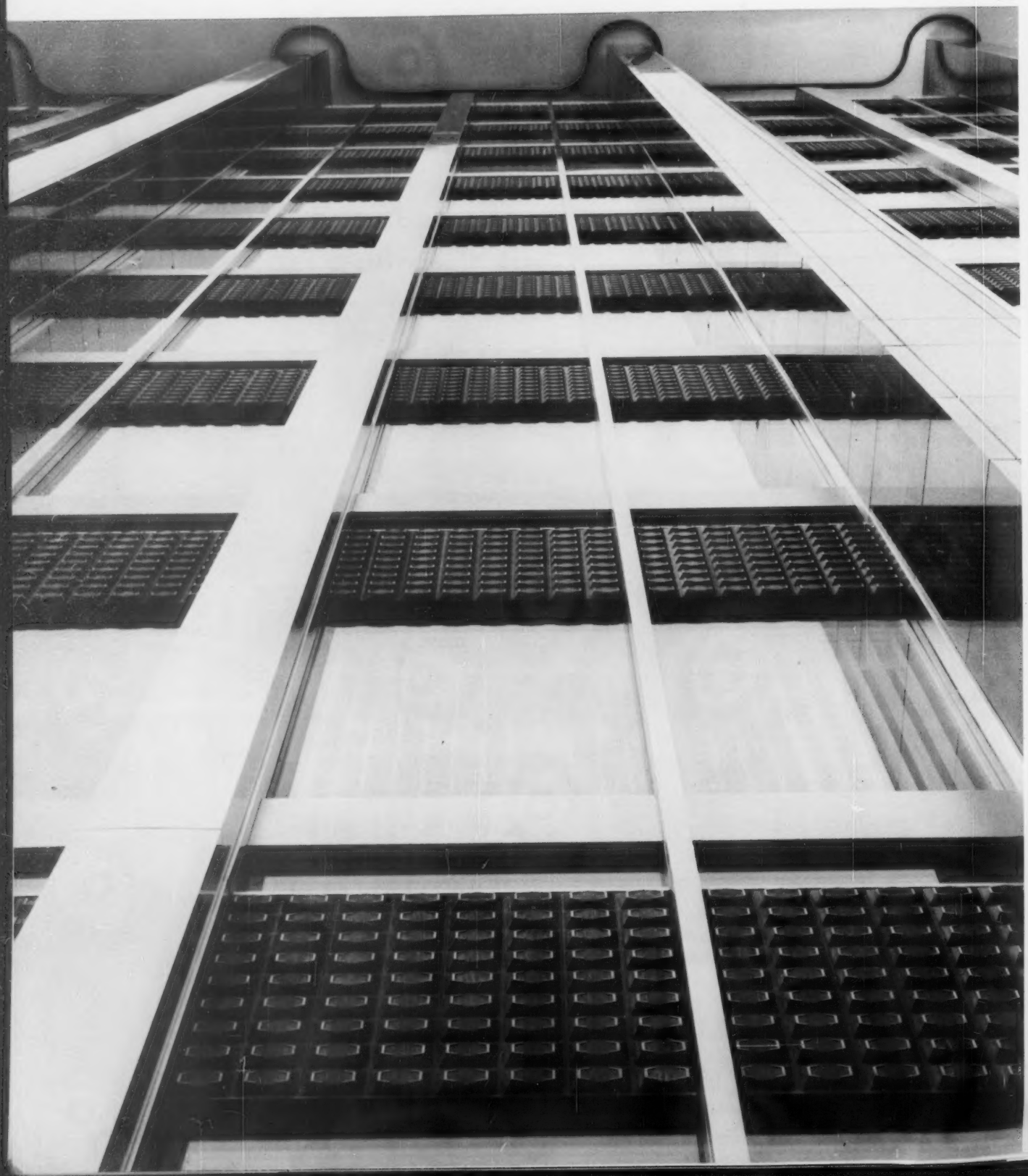
DETAIL A



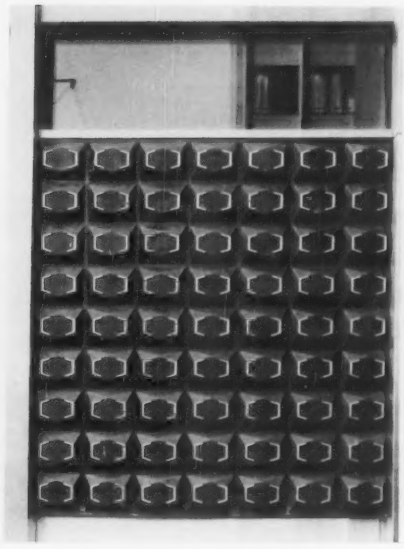
SECTION B-B



APPLICABILITY OF STAINLESS STEEL



Use of stainless steel in architecture shows evidence of being a growth industry. Its steadily expanding construction market is indicated by the fact that shipments to the building industry from mills and steel service centers in 1960 were up 30 per cent over the preceding year. Although one-half of the tonnage of stainless steel in construction was for builders' hardware, the future outlook is for a sharp upswing in other applications—particularly for curtain walls, industrial sheathing, and residential uses. Architectural specifications will be a prime factor in the estimated potential shipment of well over 100,000 tons of stainless steel in 1967. Here, a major use of this material in a contemporary office building and a roundup of impressive applications are presented.



HEAD OFFICE BUILDING

Exterior and Interior Surfacing

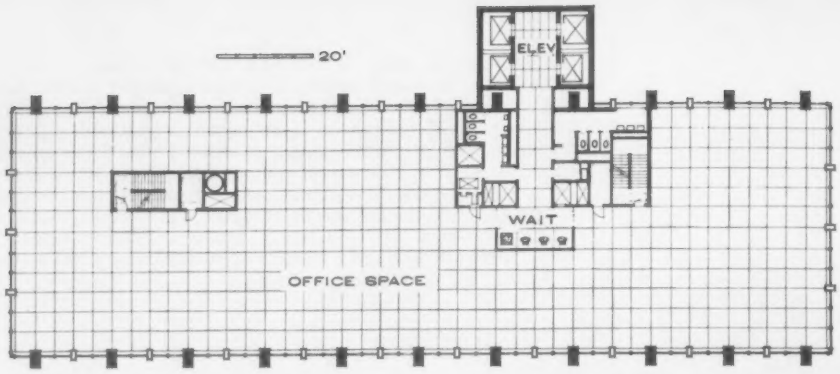
The new headquarters of Union Carbide Canada, Ltd., in Toronto takes maximum advantage of the architectural potentialities of stainless steel. Architects Shore & Moffat enclosed their unconventional structural frame in an envelope, described in this article, that makes effective use of the material without repeating the flat monotony of many existing metal and glass curtain walls.

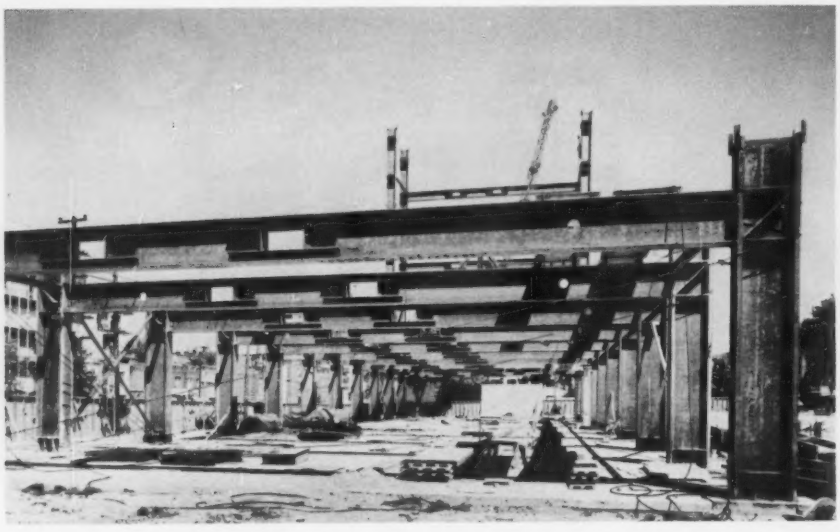
The 3-ft-deep exterior columns of the single-span structural frame produced a strong vertical relief on the two long faces of the building. The architects encased the columns in granite and designed a curtain wall with maximum areas of glass for the spaces between them.

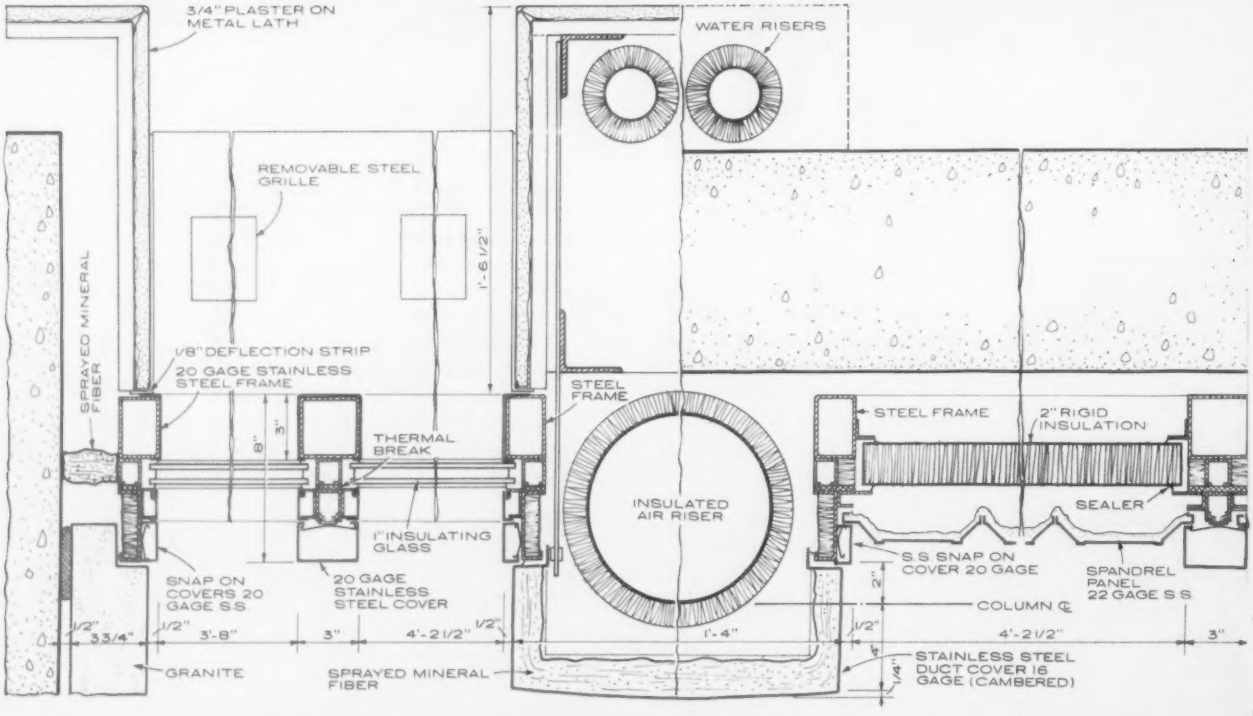
Considerable study went into the development of the embossed spandrel panels (*photo above*). At first the architects were told that it would be impossible to deep draw a stainless steel panel to the depth and pattern desired; after several unsuccessful trials, however, a panel that could be mass-produced was developed.

The small-scale pattern is derived from the company's trademark. A heat-treated coating was applied to produce the blackened field and the raised surfaces were then polished. With this coloring and highlighting, the texture appears deeper than it actually is.

As a corporation headquarters, the building had to provide a high percentage of exterior office space appropriate for executives. Considering this requirement and the need for adaptability to expansion, the architects decided upon the elongated rectangular plan.







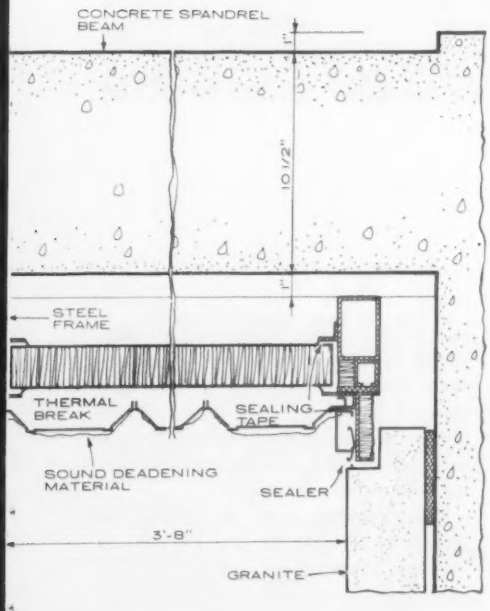
PLAN THRU WINDOWS & SPANDRELS 1 1/2" SCALE

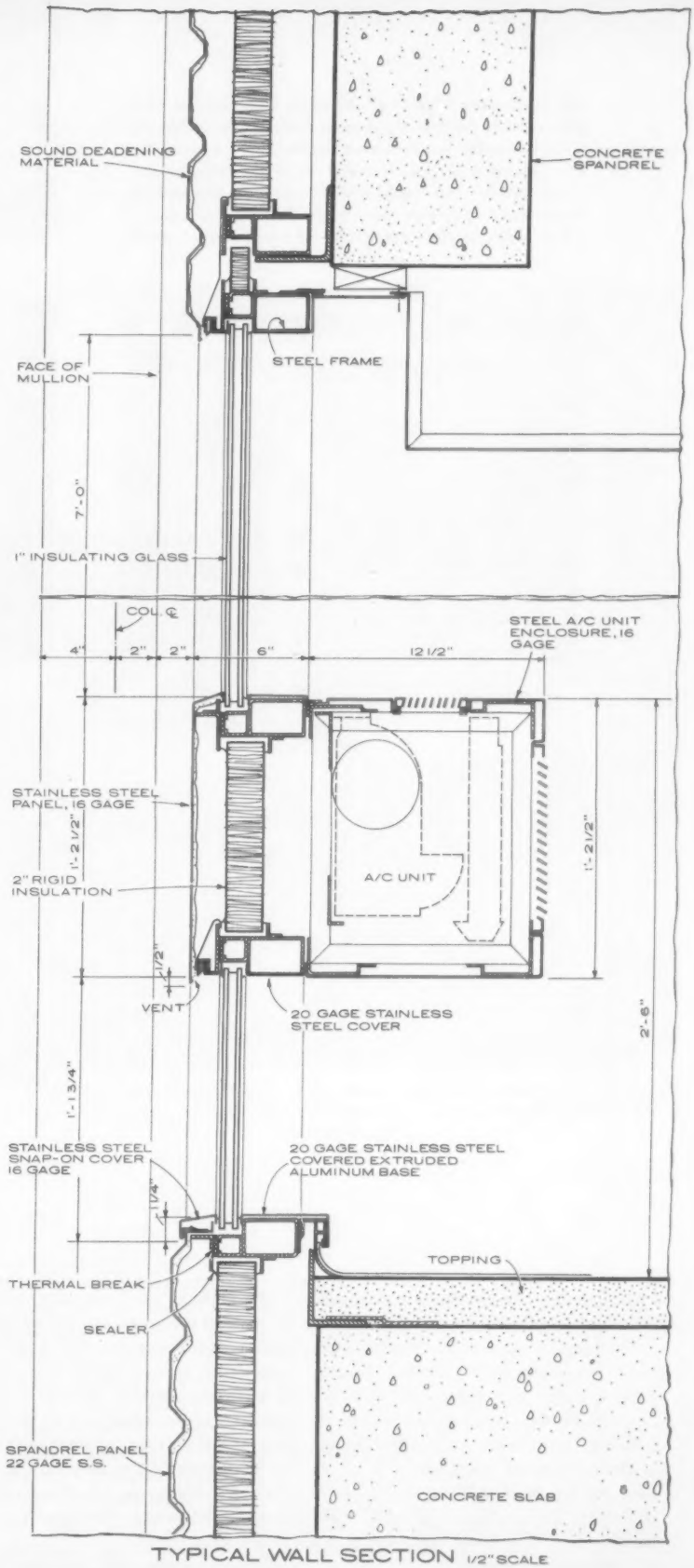
When the basic outline of the plan had been established, with a width of about 60 ft, the structural possibilities of a single-span rigid frame, with no interior columns, were considered. Such a scheme would provide an ideal uninterrupted interior space, but there was a question of its economic feasibility.

A conventional three-span structural frame was designed and priced for comparison with the single-span bent. The calculations showed that the single-span design was 50 per cent heavier, but 24 per cent lower in unit price; the total cost was 20 per cent greater than a conventional frame.

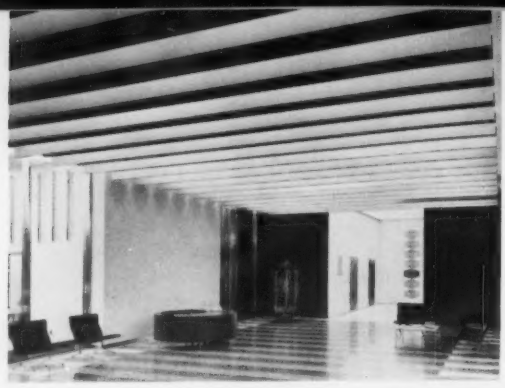
The most serious architectural problem of the single-span frame is the unusually great depth of the girders. Beams of the depth required here, however, would accommodate openings so that air-conditioning ducts could pass through the girders, rather than being suspended under the framing as in conventional structures. The result was a net reduction in floor-to-floor height that eliminated over 8 ft from the total height of the building as compared to conventional framing. Considering this reduction, there was a net saving of about $182,000 with the single-span frame.

No new or unusual engineering principles were involved in this structural design, but complete co-ordination between structural and mechanical engineers was





TYPICAL WALL SECTION 1/2"SCALE



The lobby walls (right, top) *are of black granite and white glass mosaic; bands in the terrazzo floor echo the ceiling pattern. In a typical reception area* (below), *black seats against a bright red wall draw the visitor in. On the executive floor* (right, middle), *glass walls framed in stainless steel separate a secretary's office from the corridor. Partitions in a general office* (right, bottom) *are of colorful baked enamel panels.*

required so that the pattern of ducts could be integrated with the structural members.

The frame is made of 11 identical steel bents that span 65′-9″ between column centers. Their clear span of 62′-9″ is believed to be the longest of any multistory building frame in the world. The columns of the lower seven floors are made up of shop-welded plates: 33⅜″ x 1″ web plates with 16⅝″ flange plates, 3½″ to 2″ thick. On the upper four floors the columns are 36″ wide-flange sections.

The girders, which are butt welded to the vertical members, are 36″ wide-flange sections, each with two 18″ x 36″ holes through the web for ducts. The sequence of welds was carefully planned to prevent distortion of the frame, and all field welds were tested by the ultrasonic method. As an illustration of the simplicity and consistency of the frame, only five detail shop drawings were required to erect the entire 2000 tons of steel.

Concrete joists, 12½ in. deep, frame into the top of the girders and are supported by the integrally poured encasement concrete around the girders. The spandrel beams are 36-in.-deep concrete sections in which the steel erection trusses were incorporated as additional reinforcing to expedite construction.

The structural bents are clearly expressed on the exterior. The top story is recessed, exposing the granite-clad columns and the roof girders to which they are rigidly connected.

A typical assistant manager's office illustrates the interior treatment of the curtain wall. The air-conditioning enclosure is raised above the floor with a clear-glass panel below it.

Since the interior was to be free of columns, the elevators were placed in a tower of concrete construction separated from the main building mass. A 5′ x 5′ planning module was selected as most adaptable to the client's space requirements; all offices were planned as multiples of this unit.

Partitions are composed of 5-ft movable porcelain-enamel panels, with stainless steel uprights between them. Storage units with folding doors have the same finish as the wall panels and are interchangeable with them. On the tenth floor, which houses the executive offices, partitions of glass, hardwood, and cork panels were designed in association with interior designer J. & J. Brook, Ltd.

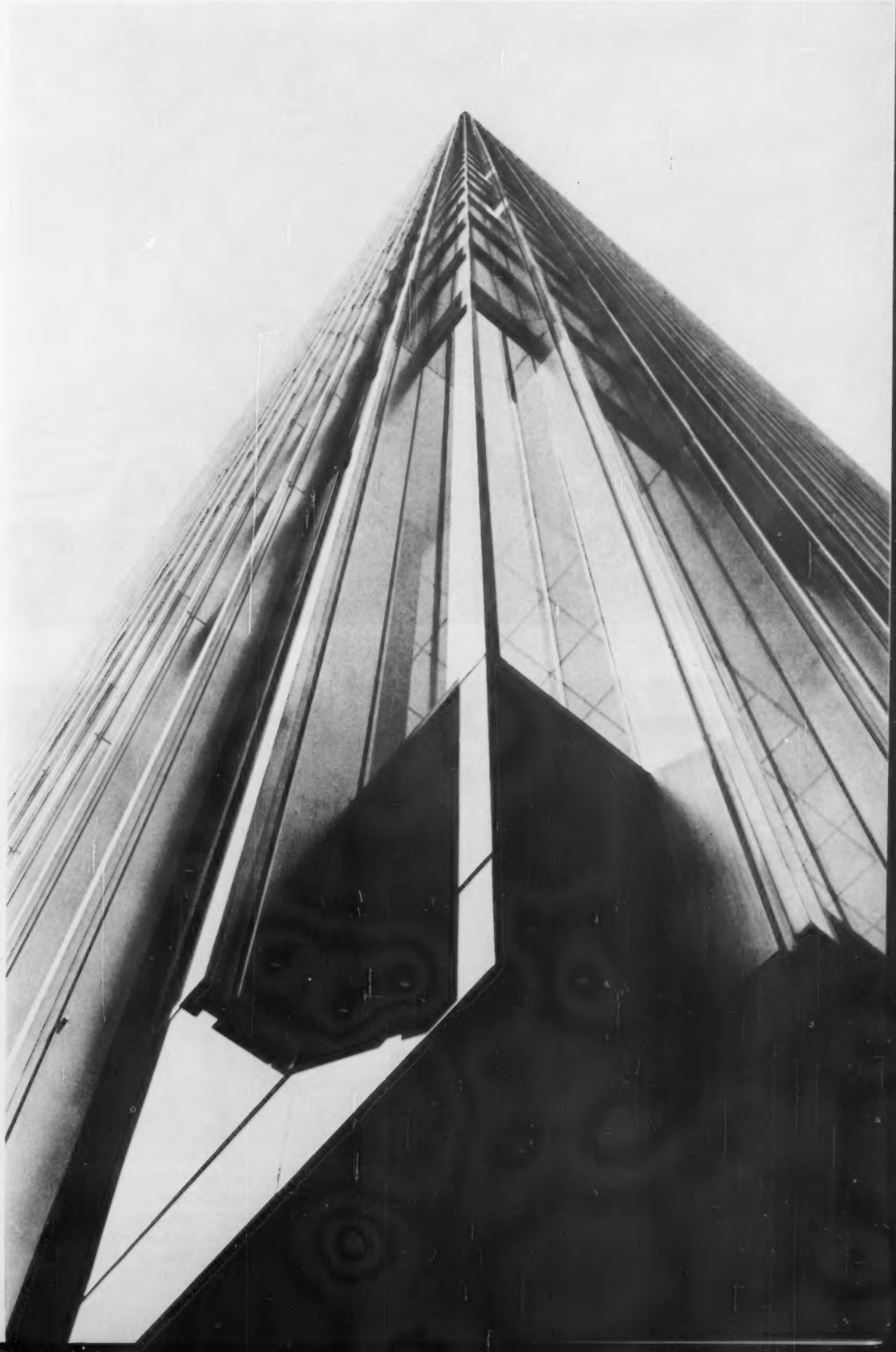
Lighting, ducts, and diffusers are all related to the 5′ x 5′ module. In the executive offices, there is a continuous luminous ceiling of ¼″ opal glass supported on stainless-steel strips. Other floors have fluorescent lighting fixtures recessed in metal-pan ceilings. The main lobby has indirect lighting filtering down through baffles; a higher light intensity is maintained in the adjacent elevator lobby, where a luminous ceiling lights up the white walls and accentuates the company trademark.

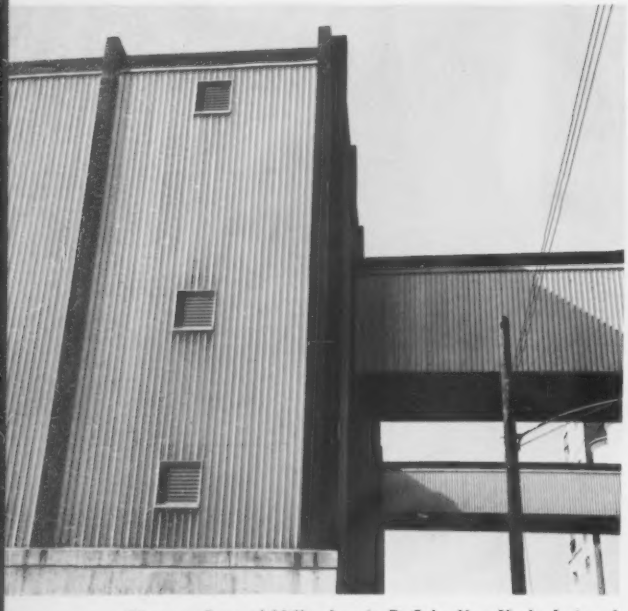
The zoned air-conditioning system provides high-velocity air to window units around the entire perimeter; low-velocity air is fed to the interior spaces through the perforated metal ceiling from a plenum above it.

Application Roundup

Structural drawings of the arch designed by Eero Saarinen for the Jefferson National Memorial in St. Louis are now being completed by Severud-Elstad-Krueger Associates. The lower 300 ft will have composite structural walls made up of an outer layer of stainless-steel plate, a core of concrete, and an inner layer of carbon steel. This sandwich will be held together by high-tensile-strength bolts. The upper 330 ft of the structure will be entirely of stainless and structural steels.

The 52-story Union Carbide Building in New York, designed by Skidmore, Owings & Merrill, uses more stainless steel than any other building in the world. Every piece of exterior metal is stainless steel, either in natural color or in a black matte finish.





The new General Mills plant in Buffalo, New York, designed by the Office of J. Fruchtbaum, is 125 ft wide and 135 ft long. Stainless-steel panels 40 ft high are composed of 12-ft-wide, double-ribbed units of 20-gage, Type 302, selected for color uniformity and corrosion resistance.

Green-tinted glass windows and spandrels of the 4 Gateway Center Building in Pittsburgh, by Harrison & Abramovitz, are framed by mullions of 16-gage Type 302 stainless steel and horizontal strips of gray stainless steel, colored by a recently developed modified acrylic resin.

Eastern Air Lines Terminal Building (right) *at New York International Airport, Idlewild, employs a "downhill-flow" system of ramps devised by Architect Chester L. Churchill to eliminate stairs throughout the building. Symbolizing this concept at the two-level automobile entrance of the terminal is a ramp suspended from stainless-steel cables.*

The recently completed retractable dome of the Pittsburgh Public Auditorium (acrosspage), *designed by Architects Mitchell & Ritchey, is 415 ft in diameter and 136 ft high at the center. It is sheathed entirely in stainless steel of 20 and 22 gage, Type 302. The 7580 sheets of steel have horizontal lock seams and vertical batten seams.*

Built for the City of Philadelphia and its Convention and Visitors Bureau, this Hospitality Center by Architects Harbeson, Hough, Livingston & Larson is enclosed by glass walls framed in nickel-finished Type 302 stainless steel. The circular roof is supported on steel arms cantilevered from a concrete stem.

Campaign chair. Flat, round, and triangular steel bars; folds to umbrella size. French, circa 1810. Collection of Michael Greer.

Campaign bench. Brushed chrome, tapered steel rods. John Vesey, 1959. Mfr.: John Vesey, Inc.

Armchair. Chrome-plated steel tube; canvas. Marcel Breuer, 1925. Collection Museum of Modern Art.

SPECIFICATIONS DATA

STEEL FURNITURE

BY WILLIAM ARMBRUSTER

Although a great deal of steel furniture is specified today and even some custom designs executed, architects by and large do not know too much about the behavior of different types of steel or about proper joints and finishes. In this article, William Armbruster, architect, furniture designer, and officer of the Edgewood Furniture Company, discusses the facts pertinent to a knowledgeable specification of steel furniture. For background information on early steel furniture included in this article, the author and editors are indebted to interior designer Michael Greer, whose research was published in Antiques.

The use of steel for steel's sake—that is, the conscious use of the material in the visible components or the morphology of furniture—dates from the early 1920's. There were precursors, as in other fields, but the early efforts were tentative and comparable to the efforts by the operators of the Gutenberg Press to duplicate hand-wrought illuminated letters and manuscripts. In the early furniture, steel did not often appear as steel, but was given a surface treatment to simulate wrought iron, bronze, gold, or precious woods.

During the Napoleonic campaigns, gunsmiths and ironworkers executed steel furniture that could be folded or disassembled so that it could be easily transported without damage. Collapsible campaign desks, beds, tables, and folding chairs were executed, but most of these were designed by cabinet-makers, who applied the gilt-bronze details that were traditional in wood furniture.

Western European architects of the 1920's and '30's, who recognized furniture as an element of architecture and were also seeking new, unencumbered shapes and forms in keeping with modern technology, chose steel for its own properties as an exciting material to be used in furniture design and manufacture. The physical properties of steel—weldability, tensile and compressive strength—lend themselves to strong, sturdy, elegantly scaled furniture structures.

The classic examples of modern steel furniture have, without exception, been authored by architects. Many of these are still in production or have been reintroduced to the market, such as Breuer's cantilevered tubular chair in continuous production by Thonet, and Mies' Brno chair recently reintroduced by Knoll. Further proof of their validity in the crucible of the market place is not necessary.

The main attention today, as for the past 40 years, is still primarily on chairs,

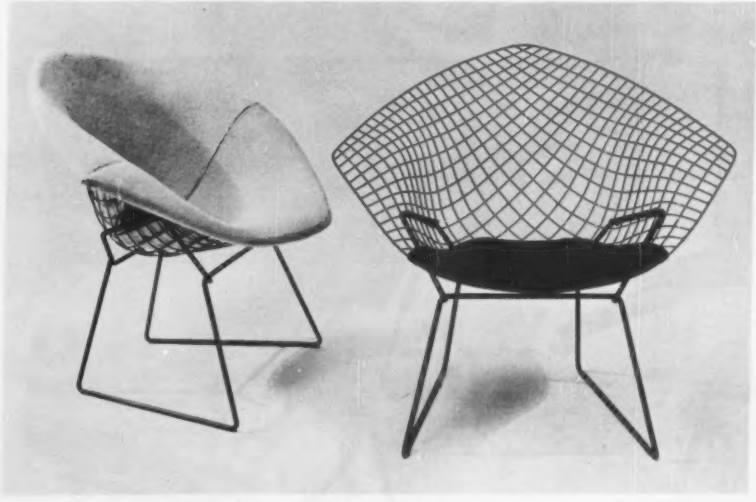
Barcelona chair. Chrome-plated steel bars; welted leather. Ludwig Mies van der Rohe, 1929. Mfr.: Knoll Associates.

Side chair. Chrome-plated steel tube; cane. Ludwig Mies van der Rohe, 1926. Collection Museum of Modern Art.

Armchair. Chrome-plated steel tube. Marcel Breuer, 1928. Mfr.: Thonet Industries.

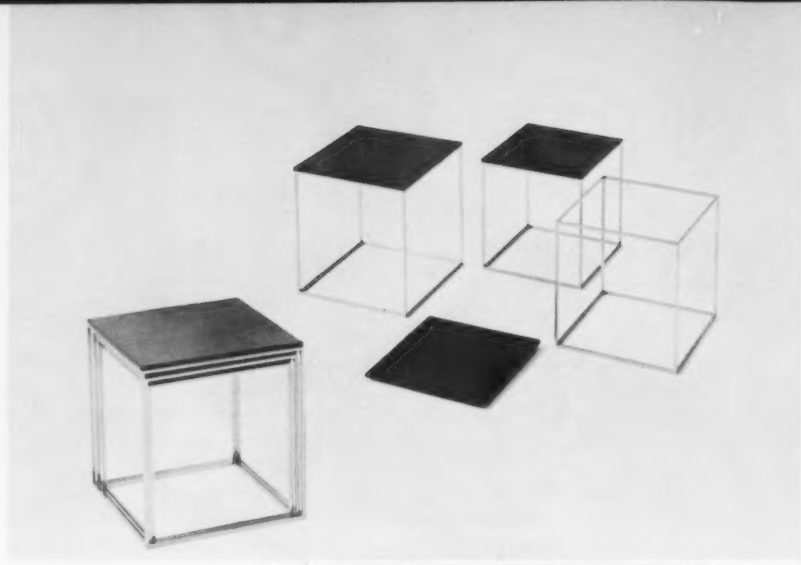
Adjustable recliner. Chrome-plated steel tube; oval steel tubes and sheets. Le Corbusier, 1927. Collection Museum of Modern Art.

Brno chair. Polished stainless-steel bars. Ludwig Mies van der Rohe, 1930. Mfr.: Knoll Associates.



Diamond chairs. Chrome-plated steel wire. Harry Bertoia, 1952. Mfr.: Knoll Associates.

Cone chair. Chrome-plated steel wire and bars. Verner Panton, 1959. Distr.: George Tanier, Inc.



Cube table nest. Chrome steel bars; plastic tops. Poul Kjaerholm, 1957. Distr.: Frederik Lunning, Inc.

seating pieces, and tables. Because of its obvious advantages, steel furniture today is specified for many applications. To the architect, its use is particularly attractive in public spaces: schools, terminals, airports, lounges, lobbies, colleges, hospitals, banks, offices, restaurants and cafeterias, and outdoor installations—in short, wherever resistance to hard wear is mandatory.

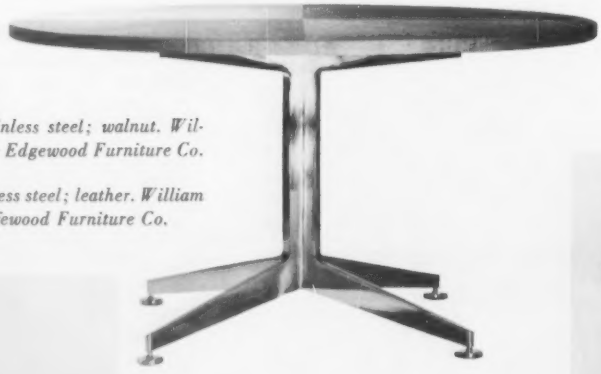
Types of Steel

Component members in steel frames, whether surface-finished, chrome-plated, or made of stainless steel, are predominately round or square tubing, round or square rods or bars, angles, tees, or channels. Steel to be surface finished is of the type known as mild steel, that is, with a carbon content of .10 to .20 per cent. The sections best suited for furniture manufacture are almost without exception cold rolled or cold drawn.

In our time, it is stainless steel that permits the designer to achieve a synthesis of sturdiness and elegance. In the hands of the imaginative designer, welded, polished stainless-steel frames, such as that used for the Barcelona chair, are the apotheosis of modern design.

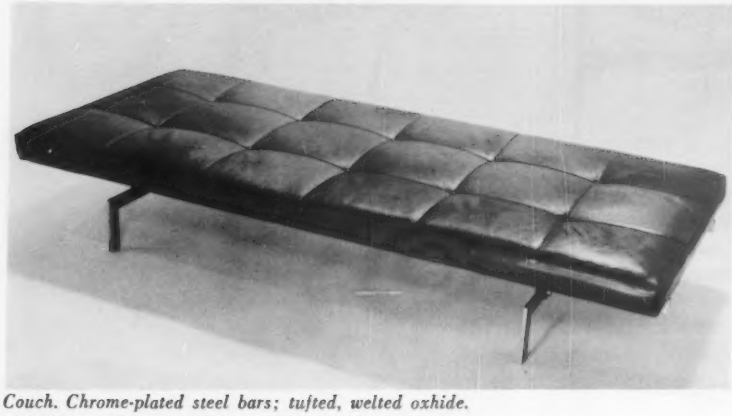
Stainless steel is not necessarily costlier than chrome-plated steel. A check in our own showrooms reveals the base of a low-priced cafeteria chair and the base of a medium-priced barrel chair to be in chromium-plated steel. All other frames in a wide range of prices, including a 15′ x 3½′ platform frame, are of welded stainless-steel construction.

For the furniture covered in this discussion, Type 300 stainless steel suffices. Sections for furniture components can be still further confined to Types 302 and 304. These two types are highly corrosion-resistant, easily weldable, and readily lend themselves to high polishing. The two types are members of the AUSTENITIC GRADES containing approximately 18 per cent chromium, 8 to 10 per cent



Pedestal table. Polished stainless steel; walnut. William Armbruster, 1957. Mfr.: Edgewood Furniture Co.

Lounge chair. Polished stainless steel; leather. William Armbruster, 1938. Mfr.: Edgewood Furniture Co.



Couch. Chrome-plated steel bars; tufted, welted oxhide. Poul Kjaerholm, 1957. Distr.: Frederik Lunning, Inc.

Armchair. Chrome-steel bars; laminated ash; leather. Poul Kjaerholm, 1957. Distr.: Frederik Lunning, Inc.

nickel, and from .08 to .15 per cent carbon. They are nonmagnetic in their annealed state and need no annealing or heat treatment after welding. The 200 and 400 series of stainless steel should not be specified for furniture because their lack of nickel deprives them of corrosion resistance. Although useful for many applications, this series is not appropriate for our purpose.

It may be useful to point out here that steel sections of domestic and foreign origin are available. Generally, the domestic product is preferable, since it is superior in surface condition, longitudinal trueness, and evenness of internal structure. The superiority of domestic steel is due to the sparing use of scrap in relation to new (virgin) ingot.

As in other areas of specifications procedure, subjectivity sometimes rears its little head. Recently the idea of "square corners" in square, stainless-steel tubing has crept into architectural conversation and even specifications. How sharp is a square corner? Since stainless-steel square tubing is deformed from round tubing, razor-sharp edges are unattainable. The sharpness or roundness of the corner is in direct relation to the wall-thickness of the material. With care, the radius of each corner can be reduced and refined. This has been accomplished by fabricators for a number of years, and the process increases the cost only slightly. A few months ago, a "breakthrough" in achieving "square corners" was advertised, although such sections have been available for at least 10 years.

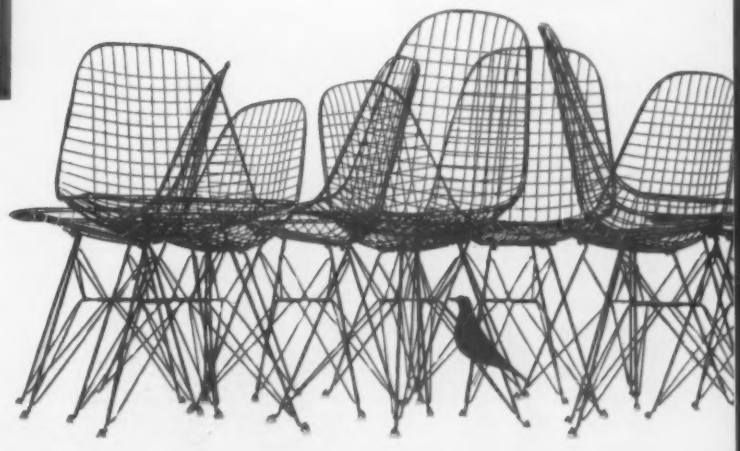
Welded Joints

In "surface-finished" steel structures or frames, there is no better method of assembly than arc-welded joints. Welding of stainless steel is best accomplished by means of the electric-arc-welding method. Types 302 and 304 stainless steel are welded with Type 308 filler rod or elec-

Storage cabinet. Enameled and chrome-plated steel. George Nelson, 1957. Mfr.: Herman Miller, Inc.

Marshmallow love seat (acrosspage). *Black steel tube. George Nelson, 1955. Mfr.: Herman Miller, Inc.*

Side chairs. Steel wire, black enameled or white vinyl coating. Charles Eames, 1951. Mfr.: Herman Miller, Inc.



Side chair. Chrome-plated and black enameled steel; leather. Katavolos, Littell, and Ross for Laverne, 1952. Mfr.: Laverne, Inc.

Polaris chair. Chrome-plated, oval spring tube; tufted leather. Robert Haussmann, 1958. Distr.: Stendig, Inc.

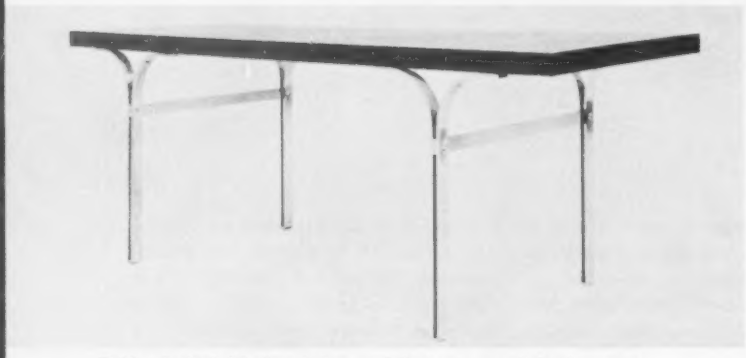
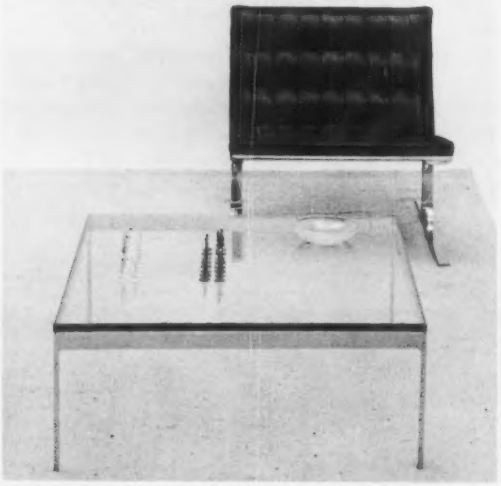


Table.. Satin-finished stainless-steel bars; wrapped leather top. Darrell Landrum, 1960. Mfr.: Avard, Inc.

Coffee table. Satin chrome steel bars; recessed in walnut top. Robert Benham Becker, 1959. Mfr.: Helikon Furniture Co.

Desk, Cabinet. Enameled steel; clip-on wood drawer fronts. G. Luss, Designs For Business, 1959. Mfr.: Globe-Wernicke Co.



Chair, Table. Mirror finished stainless steel bars; leather; glass. Nicos Zographos, 1960. Mfr.: Albano Contract Division.

Steel office furniture designed by Peter Muller-Munk & Associates in 1960 as part of a campaign by U.S. Steel Corporation to draw attention to the potentials of steel. Case pieces are double steel boxes hung from steel spanners connecting cantilevered "C" legs. Chairs are formed by light steel panels and have open steel ring pedestals.

trode flux coated. A highly recommended method of stainless-steel welding is inert arc welding. This method is sometimes known by such trade names as "Heli-Arc," "Heli-Weld," and "Inert Arc." The system offers distinct advantages: (1) flux cleaning after bead welding is eliminated; (2) weld bead grinding is greatly reduced, shortening refinishing time. Joints are sound, smooth and remarkably free from spatter or scale. Only heat tint forms on the surface along the weld seam.

The conventional torch consists of a head, usually argon, having a single tungsten electrode mounted in its center. Gas, usually argon, is dispensed around this electrode to shield electrode arc and weld puddle from the air.

Surface Finishing

After proper grinding of excess material, frames are prepared for finishing. To provide resistance to corrosion and to yield an attractive appearance, a number of processes have been developed. Most of the processes begin with an acid bath or wiping, followed by phosphating. Some of these techniques are recognized by proprietary names: Bonderizing, Parkerizing.

After proper curing, a surface finish —matte, semimatte, glossy or metallic— is applied. The surface finish, lacquer or synthetic enamel, may be baked or room-temperature cured. The difference is that the baked finish attains its final set almost immediately, while the room-temperature cured finish attains its final set in 7 to 28 days.

In our experience, the most satisfactory treatment of steel frames is a tripartite process, the efficacy of which we have been observing in our own installations for 14 years. The three steps are: (1) steel frames are sandblasted to effect degreasing and descaling; (2) surfaces are metalized by means of molten zinc; (3) a two-coat application of lacquer or synthetic enamel is applied.

Sandblasting, apart from degreasing and descaling the basic metal, yields a roughness in the surface. The molten zinc (a rust and corrosion inhibitor) follows the roughened surface of the sandblasted steel and provides a mechanical anchor for the final finishing. When this three-step process is used, it is reasonable to ask the manufacturer for a 5-to-8-year guarantee—even for outdoor use.

During the past several years, synthetic-resin epoxy (catalyzed epichlorhydrin bisphenol) has appeared and is being used as a finishing material. Although costlier than lacquer and enamels, it has enhanced the quality of steel finishing still further. Applied by means of a spray gun, it sets rapidly and eliminates baking. Though most frames are finished in black, almost any color may be specified and is obtainable.

If the steel frames are to be chrome-plated, no process other than "triple plate" should be accepted. Triple plating means that after proper degreasing, descaling and cleaning, the frames are heavy copper plated (for under-coating), nickel plated, and finally chromium plated. In order to obtain the proper and desirable surface finish, the frame must be buffed or polished between each plating.

Stainless finishes for furniture are designated numbers 4 through 8. Numbers 4, 5, and 6 are satin or brushed finishes, numbers 7 and 8 polished finishes. Generally, finish is effected by means of buffing, polishing, and burnishing. Another recent method is electro-polishing. It is a reverse process of electro-plating—that is, metal is removed (approximately .0002" to .001"). At present, the application of this process is confined primarily to small objects or parts with complex surfaces or recesses that cannot be reached by wheel.

Mechanical Joints

The size of plating tanks obviously places a limit on the size of the welded frames that can be chrome-plated. This shortcoming has forced designers and fabricators to develop and refine mechanical joints. Briefly, mechanical joints are junctures of vertical and horizontal members of a frame connected by means of a threaded hole and a machine screw. Such joints have limited applications. They do not resist vibration or indeterminate stresses, yet are often used in applications inappropriate to their qualities. It is, of course, necessary to use more than one machine screw at a joint. This method of jointing, when creatively used, yields handsome results. With contrasting materials and exposed screw heads (Allen, Phillips, etc.), it is possible to achieve an assembly that is logical and artistic.

The one-machine screw method of mechanical joint assembly is valid where a wood or metal panel supports the frame, but it must be definitely rejected for any application where this reinforcement does not exist.

As yet, little work on case pieces and storage units has been done except where utility alone is considered. However, the relatively small amount that has been done, such as George Nelson's and Gerald Luss's work, makes us expect great things for the near future. Again, they are authored principally by architects, chiefly on this side of the Atlantic. When members of the profession concentrate their efforts in this area of design, quite wonderful things will come to pass.

For a comprehensive list of suppliers of steel furniture, see page 273.

Desk. Chrome-plated and enameled steel. Architect-staff designed, 1959. Mfr.: General Fireproofing Co.

SUSPENSION STRUCTURES

There is a rapidly increasing interest today in the suspension principle as applied to structures. Although the idea goes back to primitive times—the aborigine's use of his fibrous-material footbridge—the application of the suspension principle to structures other than bridges is largely a phenomenon of the second half of the 20th Century. It is incontrovertible that cable in tension has an extremely high order of efficiency. A steel cable, for example, can carry its own weight over a distance approximating 1,000,000 diameters, compared to 500 diameters for a rod in compression. In the recent past, suspension systems have been used to roof auditoriums, dining halls, exhibition arenas, fair pavilions, and other types of occupancy. That there are possibilities for suspension in components other than roofs is discussed in two of the presentations that follow. These include an office tower which has all four of its curtain walls suspended by laminated-steel plates, and a proposed 30-story structure in which the elongation of its floor-supporting steel cables is controlled by means of hydraulic jacks.

OFFICE TOWER

Hung Curtain Walls

A new office building for Antwerp will have a suspension system for its curtain-wall and floor-framing systems. This construction method was adopted in view of the natural lighting that it provides for each office, as well as for the economy gained by the use of prefab standard components throughout the structure.

Perhaps the most unusual office structure to be erected in 1962 will be that of British Petroleum Limited, in Antwerp, Belgium, designed by Architects Stijnen, De Meyer & Reussens. Its most singular aspect is that all 12 floors of its tower, each comprising an area of approximately 8500 sq ft, will be supported on the exterior by laminated steel-plate hangers suspended from prestressed-concrete trusses located at the top of the building.

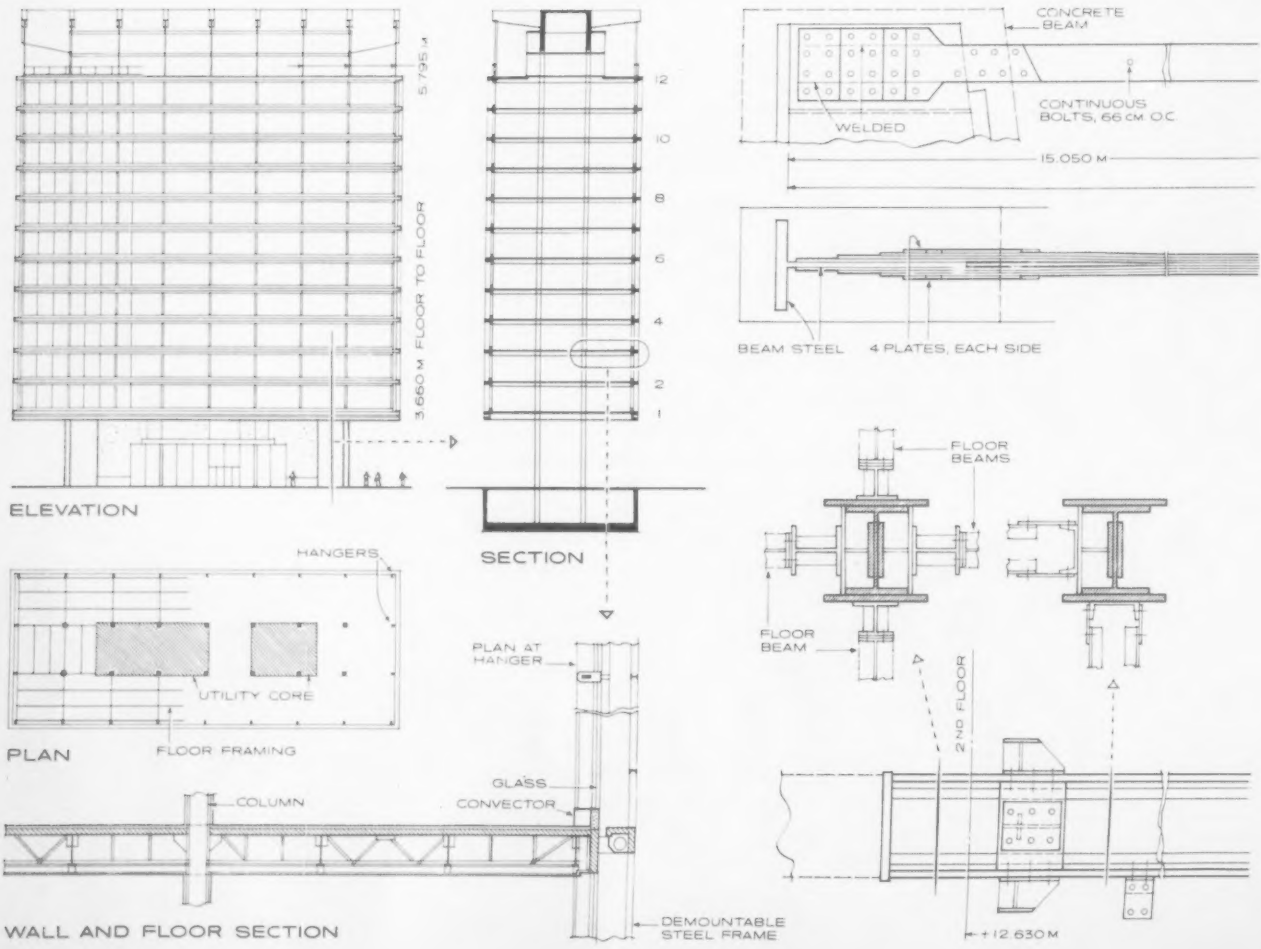
The design module of the structure is 6′-4″. Over-all dimensions are: width, 150 ft; depth, 57 ft; and height, 180 ft. Floor-to-floor height is 12 ft and suspended ceiling height 9′-6″.

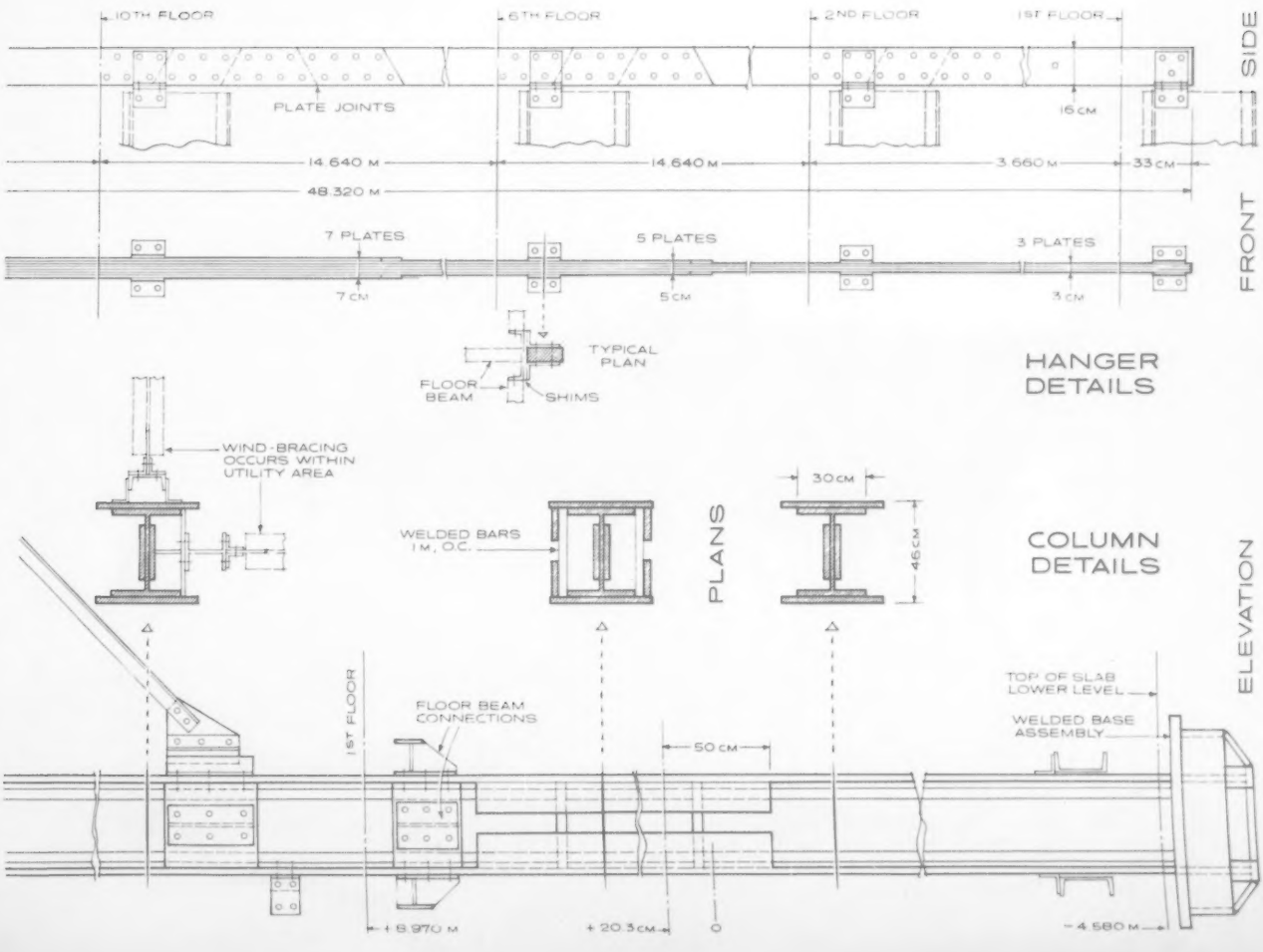
The central core, providing stability for the structure as well as space for elevator shafts, stair wells, lavatories, and so on, will be constructed of structural-steel. All columns encased in reinforced-concrete of the lower segments of the columns, where accumulated loads are of greatest magnitude, are made up of structural-steel plates. Seven of the overhead trusses are supported by the steel columns; the two end trusses, however, are hung from concrete girders cantilevered from end columns in a longitudinal direction.

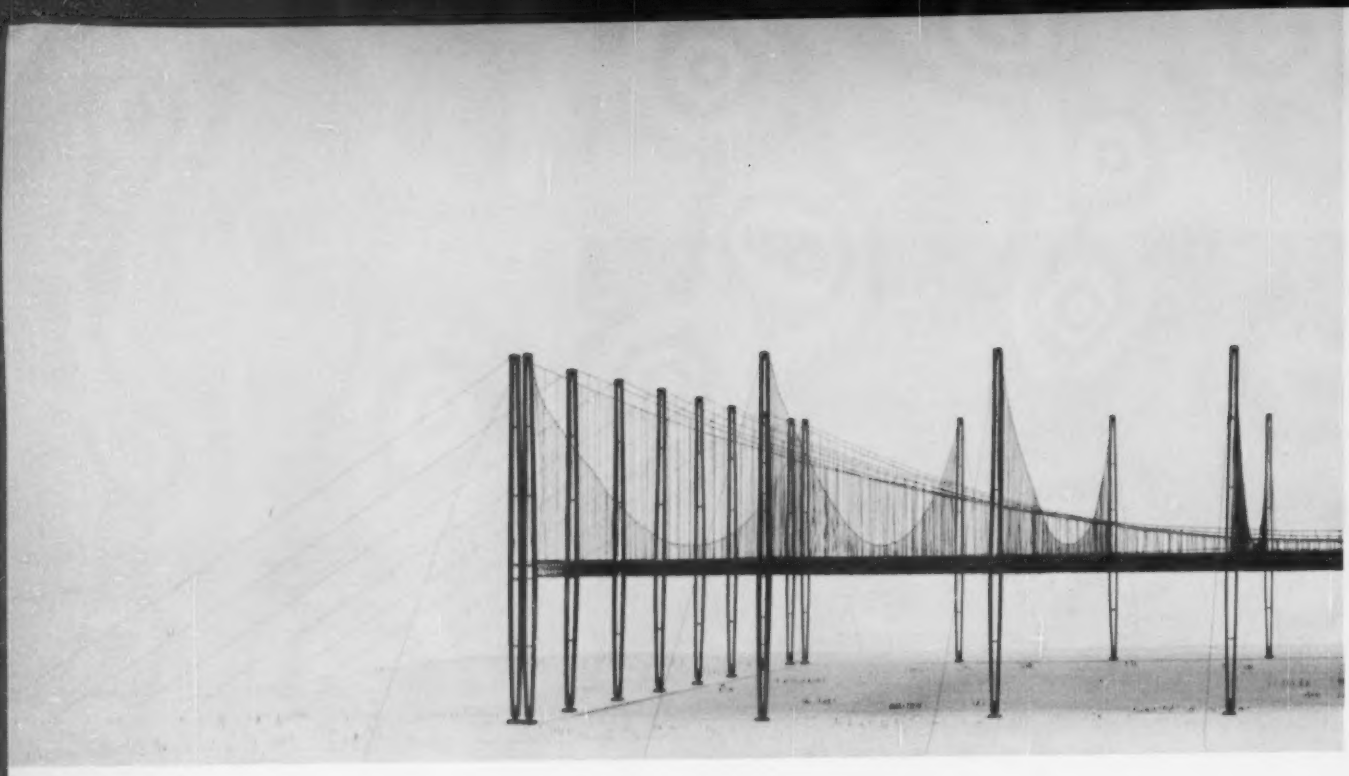
From each of the trusses, steel-plate hangers, enclosed in mullions, drop to anchorages at the bottom floor of the tower. Each hanger has a constant depth of approximately 6 in., while width varies throughout its 158 ft length. In general, the top third of each hanger is 2⅝ in. wide, the middle third 1⅞ in., and the lower segment 1⅛ in. At each floor level, the laminations are joined to open-web girders of the floor-framing system. Opposite ends of the girders are supported by columns at the core.

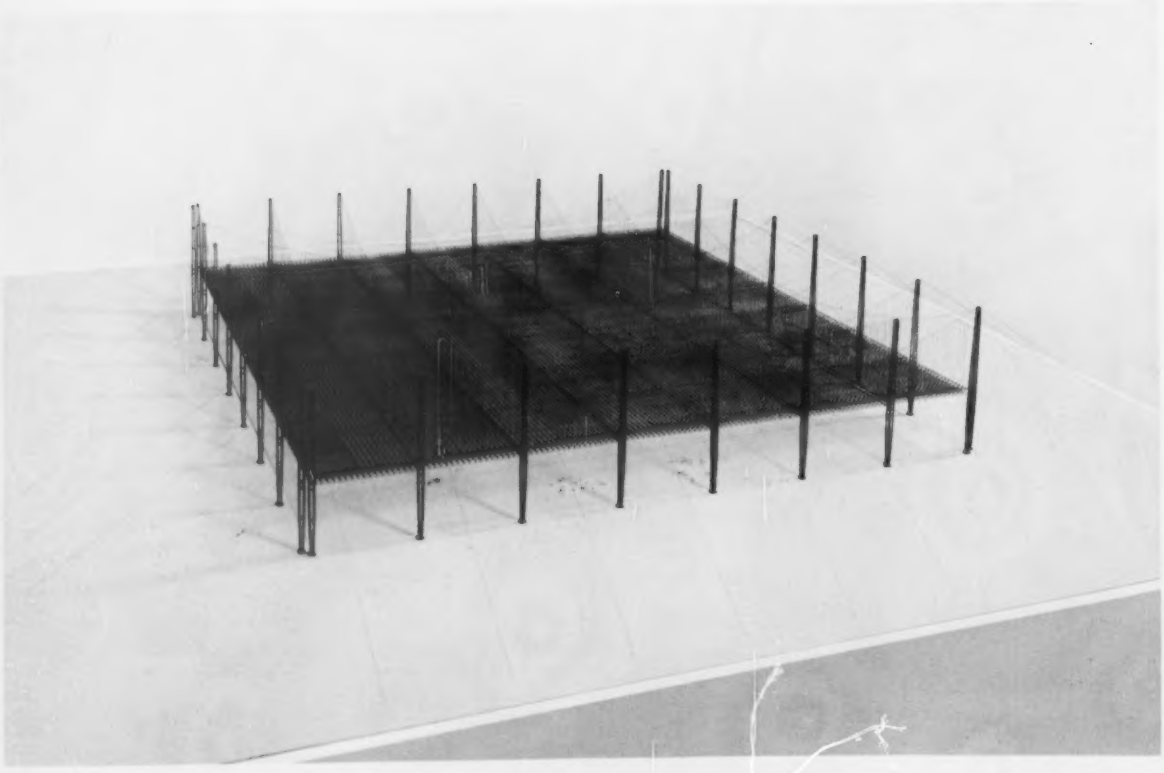
Lightweight curtain walls, cantilevered beyond the center line of the hangers, have double-glazed fixed windows held in Moulmain teak. Corner windows of each façade have operable sash. For the east, south, and west exposures, a sun screen of horizontal plastic louvers has been designed. Outer walls at lower level (extending 25 ft to bottom of tower), spandrel panels, walls of setback above the tower, and all construction above roof level are of exposed concrete.

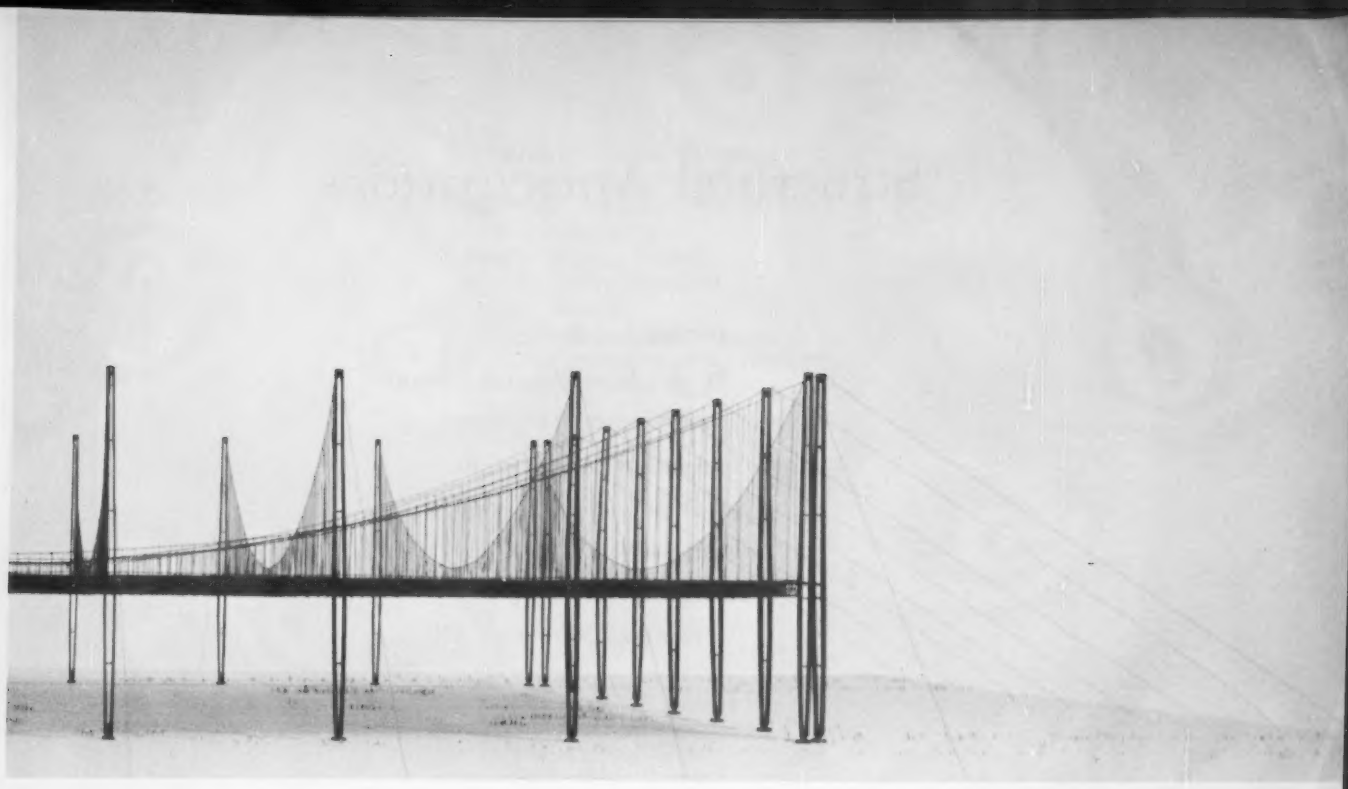
Engineers were Société Cockerill-Ougree and Bureau Constructors.




10TH FLOOR
6TH FLOOR
2ND FLOOR
1ST FLOOR
PLATE JOINTS
16 CM
14.640 M
14.640 M
3.660 M
33 CM
48.320 M
7 PLATES
5 PLATES
3 PLATES
7 CM
5 CM
3 CM
FRONT
SIDE
TYPICAL PLAN
FLOOR BEAM
SHIMS
HANGER DETAILS
WIND-BRACING OCCURS WITHIN UTILITY AREA
WELDED BARS 1 M. O.C.
PLANS
30 CM
46 CM
COLUMN DETAILS
ELEVATION
1ST FLOOR
FLOOR BEAM CONNECTIONS
50 CM
TOP OF SLAB LOWER LEVEL
WELDED BASE ASSEMBLY
+ 8.970 M
+ 20.3 CM
0
- 4.580 M







CONVENTION HALL

4-Million Sq Ft Suspended Roof

A daring use of suspension principles is proposed for a building of vast proportions and no interior supports.

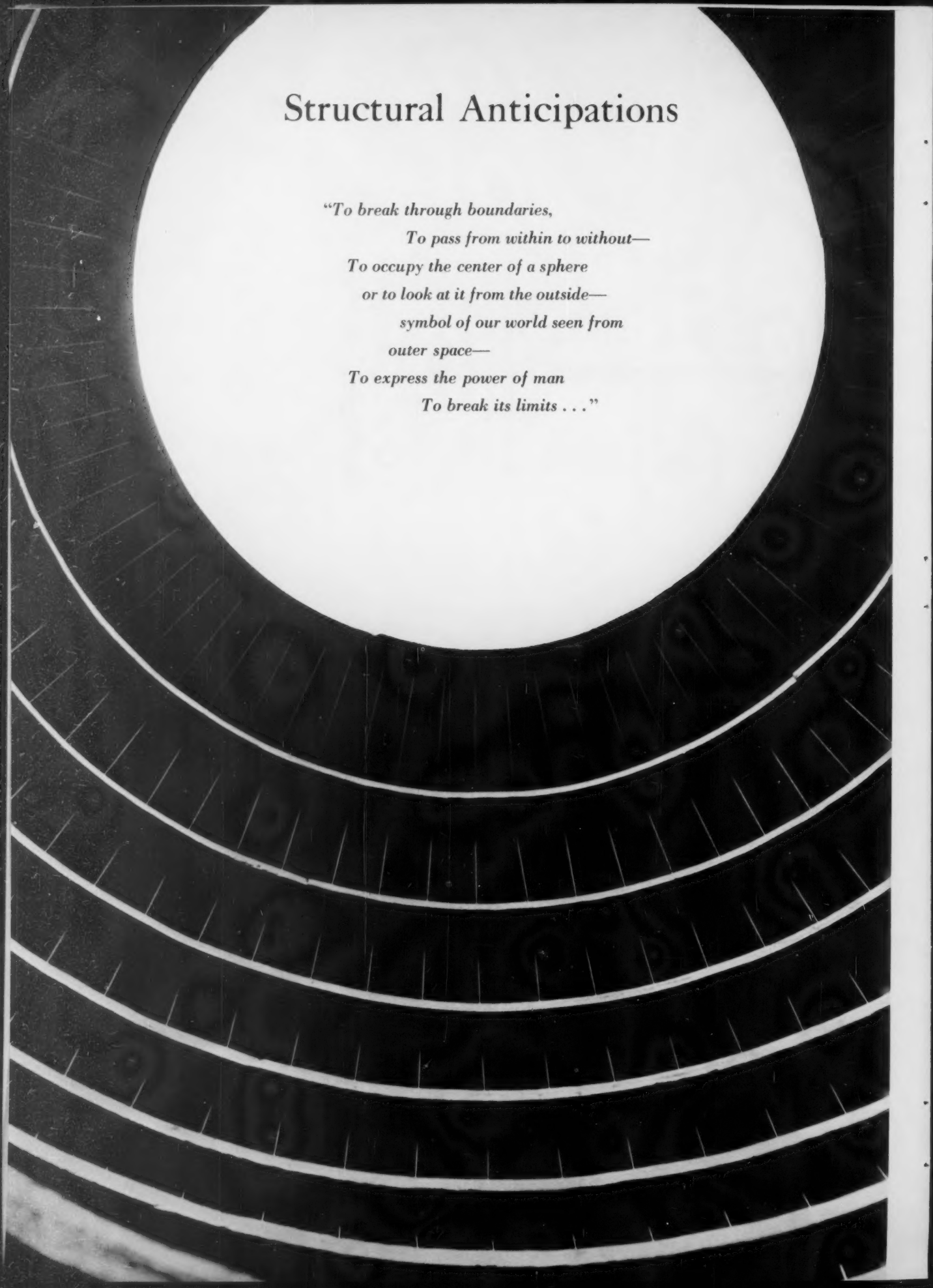
Speaking at IIT, Mies van der Rohe deplored the idea that technology could replace architecture. Said Mies: "Whenever technology reaches its real fulfillment, it transcends into architecture."

Alfred Caldwell, Chicago architect and landscape architect, speaks similarly: "A new time (with its new technics, its new material) finds a new use and a new expression. That is architecture, the new in the old."

Using the suspension principle, which is as old as the Incas (or older), Caldwell developed a vast hall while teaching at IIT. Its 2000-ft span and 180-ft height make it perhaps the largest clear-span building ever conceived. Caldwell says simply, "It is inevitable and classic."

The building is actually a series of lightly loaded suspension bridges running in two directions. Supports are 32 towers —8 on each side—of the usual plate and rolled-section fabrication. Steel cables of the type used in bridges are swung from the 475-ft towers; hangers spaced 18 ft apart support the roof. The huge suspended roof consists of welded-steel Howe trusses—18 ft deep and 18 ft o.c.—interpenetrating in both directions. Light steel purlins and steel-channel deck span between the trusses. In a sense, the trusses form a type of space frame, with panels 285-ft square supported on all four sides.

It is proposed to light the hall from this truss formation, glazing it in a saw-tooth manner. Walls would be insulated metal panels fastened to steel girts, with the girts welded to WF mullions, 180 ft high and tensioned to erase bending. Anchorage of cables would be with eye bars, fastening to a steel pull girder embedded in a cast-concrete mass.



Structural Anticipations

"To break through boundaries,
To pass from within to without—
To occupy the center of a sphere
or to look at it from the outside—
symbol of our world seen from
outer space—
To express the power of man
To break its limits . . ."

BY ROBERT LE RICOLAIS

A prophetic approach to steel in architecture is presented by a professor at the University of Pennsylvania's Institute for Architectural Research who has long been concerned with the possibilities of steel used in a tensile manner. Here he envisions structure of a type in which the skeleton is no longer a heavy external shell but is brought into the core.

"On the whole, engineering structures will tend to become more like biological ones; more especially, they will tend to resemble the smaller animals such as insects, where the stresses due to the weight are less important than the stresses due to other forces. With lighter, stronger and more flexible structures, the weight of the structure itself, which in most cases is a very substantial part of the stress, will become relatively unimportant. The world of the future may be expected to look more ethereal, more like fairyland than the world of the present or the past."

SIR GEORGE THOMSON,
The Foreseeable Future

To most readers of this article, the common four-legged table would appear to be a very simple structure. To the stress analyst, however, it is not a simple structure. For an object to *look* simple does not necessarily mean that it *is* simple. This example is mentioned to point up the strange position of the designer (practicing or student) lost between apparently trivial problems and the intricacies of analytical expressions. This may explain the somewhat justified conventionalism of our approach to structure.

Before treating the subject of structures in tension, a few words should be said about a subject that indeed has some connection with it: space frames.

Despite the apocalyptic language which has been used and abused to "explain" space frames, it is somehow ludicrous to realize that, in terms of true scientific contribution, nothing much has been added since Professor B. Mayor's report to the French Academy in 1902, in which graphic statics was applied to three-dimensional systems. Exception, of course, should be made for the considerable work published by Dr. Z.S. Makowski of London Imperial College. Much more significant than recent chromium-plated (or anodized) fair pavilions is Mayor's simple axiomatic proof that "all space frames are capable of a planar stress representation." This remark is intended to expose the erroneous belief that space frames are the *ne plus ultra* of modern structure and the panacea for large-span buildings.

In support of Sir George Thomson's statement anticipating the future of engineering structures, which he made during the past decade and which we quoted above, it is not incongruous to recall here the pressurized or hydraulic supports of the Eiffel Tower, and the introduction of dynamic forces made by Freyssinet for the Beni Badhel dam in Morocco (amounting to some 800,000 tons). We should be concerned with history only to the extent that it allows us to extract from the past some predictable future gain. It would be futile, therefore, to trace the course of modern ideas on tension without recalling how closely its development is associated with that of weapons. Artillery has certainly been the determining factor of many important technological advances; and for those who wonder at the excellence of Soviet missile technology, it may be remembered that in the last century Russia had the most eminent crystallographers, capable of developing highly refined steel. It is not by pure coincidence that the idea of pressurization of light envelopes, which is currently being favored in the Atlas missile, was claimed as early as 1892 by a citizen of Russia. Patience, then, should be the cardinal virtue of inventors; yet, when we know the hours wasted in second-hand archaeological researches, we may question whether a systematic survey of recent ideas would not be a more suitable investment.

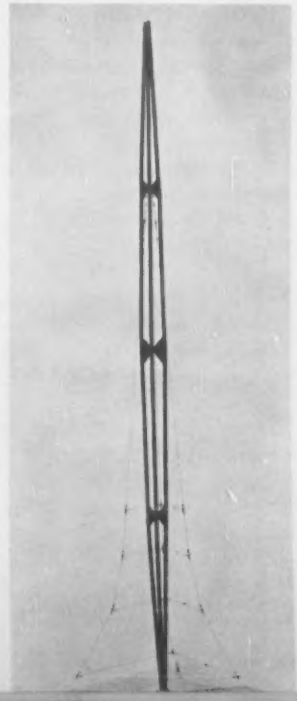
Before commenting on technical innovations, a few words should be said about the problem of design, which is as closely associated with cost as with materials. In my opinion, the specialized design engineer working with a particular material and particular methods sees only one side of the problem. His thinking should, instead, become committed to a larger area involved in the study of Unified Fields of Structures. What is of importance today is not so much the study of a particular system of structure as the study of "structure of structures." Instead, architects and engineers today keep on endlessly arranging and rearranging space or materials in a vast Penelope-like tapestry dominated by arbitrary decisions and vested interests.

It is a fascinating aspect of science that we rarely discover what we are looking for (when not searching for trivial details), but usually find something else. In other words, the answers formulated by nature to our queries are more significant than the questions themselves. Scientists are concerned with arrangement, no matter of what. While we are looking for a privileged arrangement of bars, the answer may be a new molecular compound. This is precisely why Professor Mayor's finding ("All space systems are capable of a planar stress representation") is, to repeat, of fundamental importance: it holds true not only for a situation of bars but also for a situation of stresses, which can be minimized according to mathematical procedure. The same mysterious algorithm invades diversified disciplines; to avoid confusion, duplication, and loss of mental energy, it is time for order and decision to enter the hierarchy of research.

This is not the place for further discussion of this point. To conclude with a specific observation, however, it is my conviction that to use high-tensile steel in conventional trusses is next to insanity. Mixing up wholly diversified elements in structure is very much like the confusion of order and direction resulting from a procession of adults preceded by a band of three-year olds.

Internal Pressure Systems

The introduction of internal pressure into a structural system is conspicuously analogous to the use of air to support vehicle weight. It is simply a form of prestressing the air chamber, but with a curiously inverted consequence—with concrete structure, the object is to replace tension by compression forces, but when the pressure chamber is steel the object is to substitute tension for compression. The advantages are considerable: (1) the buckling action is canceled; (2) with the use of a reinforcing ring, it is theoretically possible to achieve an economy of 50 per cent in the weight of metal, in transferring the load from a given point to another. Needless to say, the introduction of a fluid under pressure calls for many precautions and is not without complicated problems. Perhaps its more interesting sideline is the control of deformation or elongation within a pre-



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determined range—thus creating what I call a "Reactive System" **(1)**. At each point where the cable meets the ground, an electronic device actuates a pressure pump to bring back the elongation to a fixed value.

It should be understood in this discussion that we are more interested in performance—i.e., minimum weight of structure—than in economic structure. Steel is a noble material and has to be handled with a refined technology. The time is not far distant when to use steel as a compression member will be as unthinkable as to use concrete for tension. Of course, it is acknowledged that all materials, per se, are worthy of respect; yet to my mind the technology of thin-shell concrete is a thing of the past, compatible only with unorganized materials of low specific weight, such as a compound plastic. In terms of pure form, thin shells are nevertheless remarkable objects; but in my opinion they become even more beautiful when converted into what the mathematical theory wants them to be: pure membrane. This is why one of our purposes at the Institute for Architectural Research has been chiefly the conversion of membrane into a network formed with an ordered arrangement of cables.

The use and preference given to cable with respect to any other elementary form is based on a quite simple reason. A steel cable can carry its own weight over a distance approximating 1,000,000 diameters, compared to 500 diameters for a rod in compression.

Pretensioned Networks

The objective is to stretch the cables forming the structure in such a way as to reduce the deformation due to the external loads. The advantage of dealing with networks (the *exact* analog of soap film under superficial tension) is to distribute the punctual loads along two or three axes according to the characteristics of the network employed. The optimum conditions are obviously achieved by using triangular networks, with the implication of six-branch connections. The weaving of the net requires certain consideration and appropriate devices to reduce friction.

Minimal Surfaces

From the soap-film analysis, two distinct systems can be deduced for spanning large areas with minimum weight: (1) double-curvature networks (DCN); (2) monkey saddle (MS) or three-corner saddle networks **(2, 3)**.

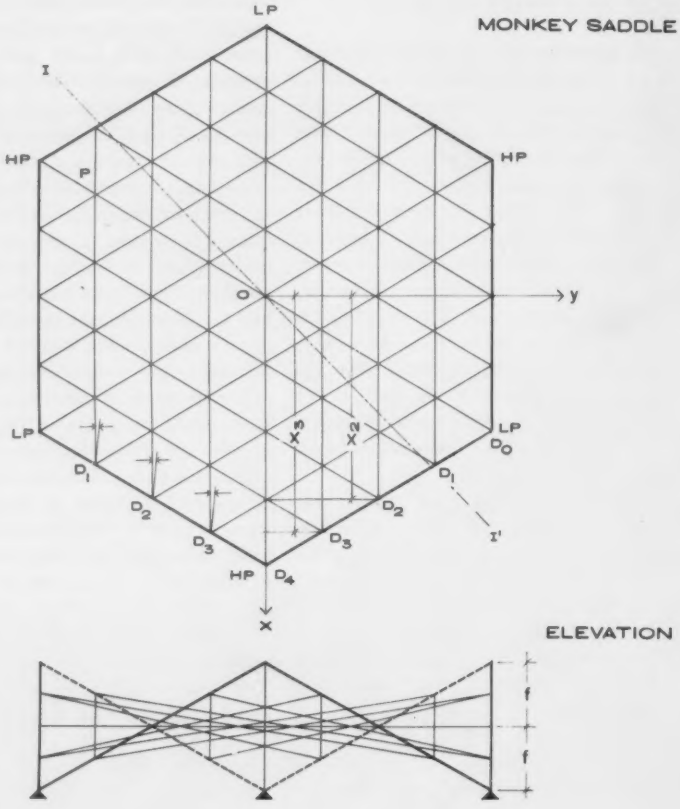
The DCN system is capable of two versions: concave network for radar dishes, and convex network for structural application. The MS system is an illustration of the application of a two-curvature surface described by David Hilbert, the German mathematician, which can be defined analytically by the following equation:

$$z = x(x - y\sqrt{3})(x + y\sqrt{3})$$

where x, y, and z are the monkey saddle surface co-ordinates.

The tension on a three-way network taken on the boundary, where v is the reaction of support and ϕ the angle of the cable with the horizontal plane, the cable tension T is yielded by:

$$T = \frac{v}{\sin \phi}$$



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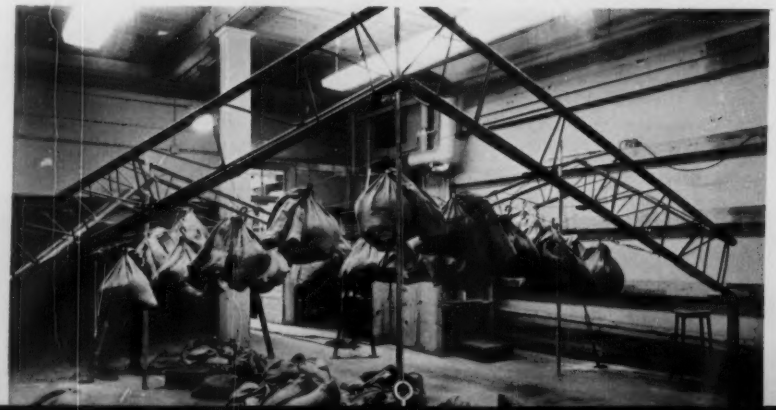
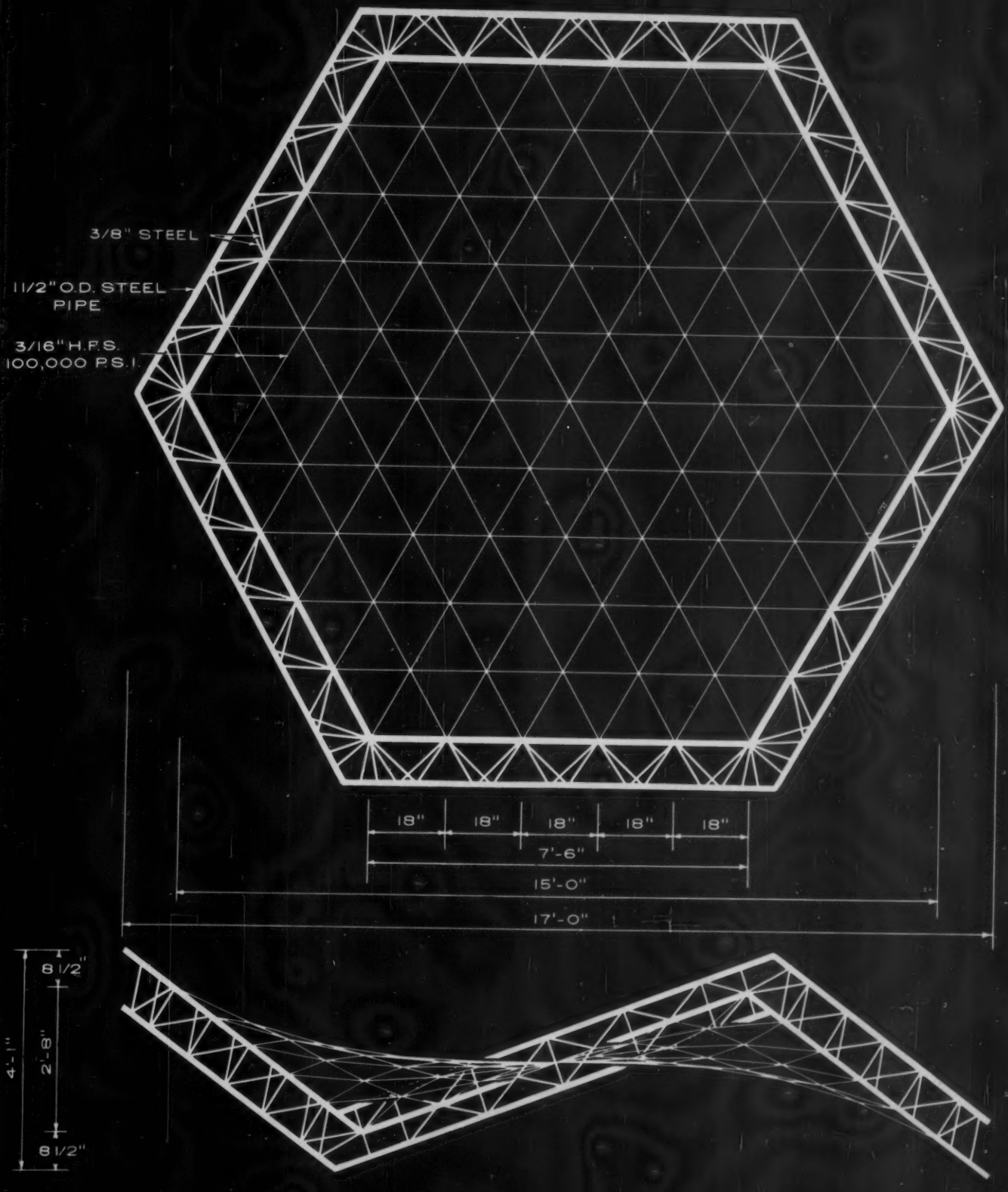
Fully-loaded monkey saddle (3000 lb); dimensions acrosspage. 3





PLAN & ELEVATION OF MONKEY SADDLE

SECTION OF THE BOUNDARY CUT AT RIGHT ANGLES TO PIPE

The value of ø is obtained by:

$$z^1 = \frac{dz}{dx} = \frac{3f(x^2 - y^2)}{r^3} = \text{tg } ø$$

This expression involves a sign change when $x = y$, meaning that on the right of the isotropic line $x = y$, the cable will no longer be in tension but in compression. All punctual loads on the right of this axis will be taken by the diametral cable at higher altitude. The value of the parameter f is given by:

$$\text{tg } ø = \frac{3f}{r}$$

Above relationships permit computation of the stresses in all the cables.

The results obtained are in fair agreement with the formula of pure membrane (within 1.5 per cent). For rapid computation, it is practical to use the membrane theory. As an example, for a building of 330-ft diameter, under external loads of 20 psf, the approximate weight of cable would be about 2 psf. Excluding the boundary for small diameter, 50 ft for instance (since we are speaking of cable weight only), the cable weight for 20 psf of vertical load would be about 0.64 psi for DCN, and only 0.38 for the MS. Practically, the boundary conditions would be met more economically with the DCN than with the MS.

We had neither the equipment nor the personnel available for further tests. As we see it, the advantages of the network technology for building applications can be substantiated as follows:

1 Transporting forces with a weight of material in direct ratio to the span instead of the square as in compression structure.

2 Absence of vibration or fluttering due to the high number of connections, by reducing the vibration period.

3 Stability of the structure under inversion of sign of external forces, due to the symmetry of the system.

4 Since the dead weight of the network itself is practically negligible, there may be great flexibility of contour, not just restricted to a circular plan.

5 Ease of erection, since the degree of accuracy is not as prohibitive as in a compression system.

6 Possibility of weaving the network on site, the structure forming a rigid body for subsequent lifting operation.

7 Possibility of using plastic material for roofing.

8 Eventual use of concrete for the marginal elements.

Consideration of Future Forms

There is a French expression, "Au lieu de la carapace, l'épiderme flexible avec ses possibilites de croissance," which means, "Instead of a turtle shell, a flexible skin with possibilities of growth."

For the future of structural forms, the discrimination between tensile and compressive forces is a primary one. Indeed, it leads to a greater clarity in the appropriate choice of the vocabulary of structure.

The objectives are several: (1) To replace the strait jacket of linear profiles and columns forming the frame of the building by a tissue of network support for the curtain walls, following surfaces of maximum economy. (2) To reduce the central core working in compression to its optimum size with respect to the vertical circulation, together with an adequate distribution of members in space. (3) To control all maximum elongations and minimize them by means of fluid pressure.

As far as organic growth is concerned, the whole process tells a very old story: the origin and development of the vertebrates out of the Prostita or the Crustacea, in which, instead of retaining a heavy shell, the skeleton was brought into the core of the organism. This gave adaptability to the structure, which was then, and only then, capable of reaction to external stimuli such as light and air, thus allowing each individual cell the possibility of becoming a nucleus of growth and development. As applied to our discussion, such a structural attitude is more compatible with the purpose of life than is the solution of the metallic or concrete box of the recent past.

Space Structures and Others

When we recall that the required escape velocity from earth is about 36,700 ft per second, it is a mild understatement to say that the major characteristic of our age is mobility. How is this mobility going to change our architecture, which is still thought of in terms of Cyclopean walls?

Indeed, although man's ingenuity in his fight against gravity has been great, it is small in terms of what remains to be done. It is a timid and uncertain start. We should recall the tremendous challenge of a Roebling or an Eiffel. It is not enough for men to enjoy comfort and luxury; they need big things, symbols of their beliefs and of their hopes. It is because men like Roebling and Eiffel operated on an *enormous scale* that each arrived at his unique answer. If we had to build planes for 500 or 1000 passengers, they would have to be differently built.

What has been said of the thin-shell concept may be repeated as concerns the so-called stressed-skin construction. There is a limit where the anisotropy of the material (despite the ingenious devices of corrugations, waffles, honeycombs, etc.) is insufficient to avoid local buckling. Systems of construction are dependent on scale, and for a given scale a particular type of construction has to be used. Only the introduction of enormous internal stresses will balance the action of equally enormous external forces.

Our concept, in the Freyssinet approach for the structural technology of tomorrow, is demonstrated in the "Cosmorama," which is a building that simulates travel through outer space for 40,000 spectators. Shown on the title page of this article and (4) is a 1/100th scale model. The inner hollow sphere has a diameter of 330 ft. The building is 30 stories high. Total floor area is about 1,200,000 sq ft (three additional rings being added between each shown in the model). The total load, assuming 100 psf, would be about 55,000 tons. Elongation of the high-tension steel cables is controlled by means of hydraulic jacks through a "Reactive System," which is a patented system for the automatic control of elongation by means of mechanical or fluid pressure systems. The model weighs approximately 350 lb and could theoretically carry a uniformly distributed load of 6 tons, i.e., 40 times its own weight.

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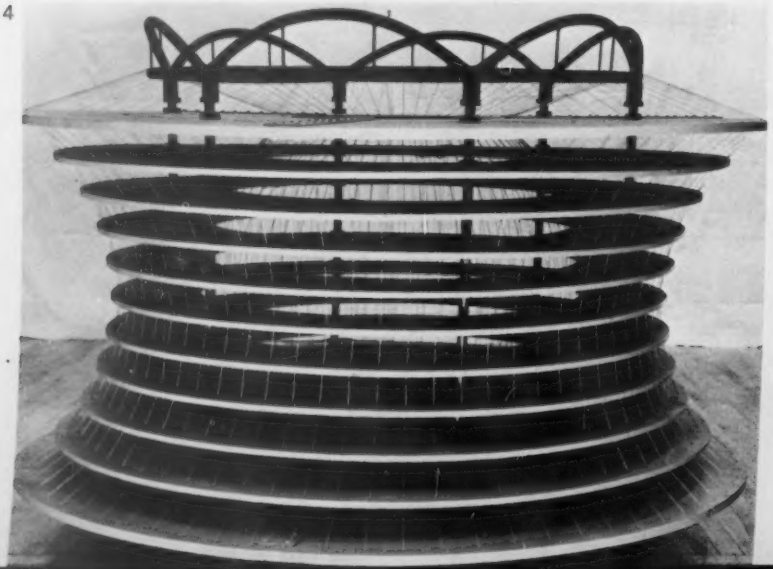

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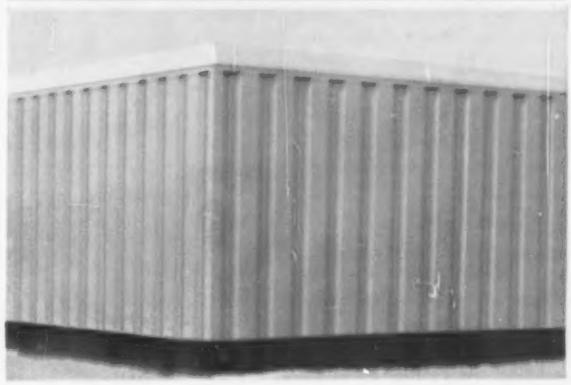

(top) EGSCO insulated wall panels with Colorgard in tan and gold were erected on this recently completed Williamsport, Pa., plant of The M. W. Kellogg Company, where the Power Piping Division is located, including engineering, research and field erection and the manufacture of power piping systems. Engineer and architect is Lester B. Knight and Associates, Inc., Chicago.

(middle) This is the new, modern Pittsburgh office of Carson, Pirie, Scott & Co., nationally known wholesale distributors of floor coverings. The architecture is enhanced by EGSCO Shadowall panels in Colorgard Gold. The architect is J. Kenneth Myers; the contracting engineers are Mellon-Stuart Co., both of Pittsburgh.

(lower) A close-up view of a curtainwall of EGSCO Contourwall in Colorgard Green. The panels form the colorful insulated metal wall for a penthouse on the roof of a modern factory-type building.

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Format for Specifications Sections

BY HAROLD J. ROSEN

A CSI proposal for the orderly arrangement of specifications promises important practical advantages, reports Chief Specifications Writer of Kelly & Gruzen, Architects-Engineers.

One of the more significant achievements of the Construction Specifications Institute, which held its fifth annual convention in New York City in May 1961, was the presentation of a "Tentative Proposal for a Manual of Practice for Specification Writing Methods." This manual was prepared by the Specification Methods Committee T-3 under the chairmanship of Rolf T. Retz of Sacramento, California.

The manual tentatively establishes a recommended national standard for format and arrangement of construction documents and includes discussions on "Bidding Documents," "Contract Forms," "Arrangement of Specifications for Building Projects," "General Requirements," "The Language of Specifications," and "Specification Writing Procedures."

Of paramount importance is the arrangement of specifications for building construction into distinctly similar groups, categories, or classifications. This is accomplished by the grouping of the various trade "sections" into a smaller number of groups or categories, which will be called "divisions." A total of 20 divisions are established as follows:

DIVISION NO.	*TITLE*
1	General Requirements
2	Site Work
3	Concrete and Related Work
4	Masonry and Related Work
5	Structural and Miscellaneous Metal
6	Metal Doors and Special Doors
7	Curtain Walls and Metal Windows
8	Carpentry and Related Work
9	Plaster and Dry Wall Construction
10	Roofing, Sheet Metal and Related Work
11	Painting, Glazing and Related Work
12	Tile, Terrazzo, Marble and Related Work
13	Floor Coverings and Furnishings
14	Building Specialties
15	Equipment, Special
16	Special Construction
17	Building Transportation System
18	Mechanical Work
19	Electrical Work
20	Utility Services

Trade sections will not be given a fixed numbering or identifying system. Only those sections which are applicable to the project will appear in the specifications and will bear the division number plus an alphabetical letter. For example, the trade section "Demolition" under the division "Site Work" will be identified a Section 2A.

Each division will now comprise several sections. For example, Division 2, "Site Work," will have the following sections:

DIVISION NO. 2, SITE WORK

Section No.	*Title*
2A	Demolition
2B	Clearing and Grubbing
2C	Earthwork
2D	Piling
2E	Site Paving
2F	Metal Fencing
2G	Landscaping
2H	Drain Tile
2I	Soil Treatment for Termite Control
2J	Railroad Track Work
2K	Flagpole, Monuments, Fountains

Under Division No. 16, "Special Construction," the following sections may be grouped:

DIVISION NO. 16, SPECIAL CONSTRUCTION

Section No.	*Title*
16A	X-Ray Construction
16B	Cold Storage Work
16C	Integrated Ceilings
16D	Luminous Ceilings
16E	Aluminum Greenhouses
16F	Swimming Pool
16G	Bowling Alleys

The section titles and their order under a specific division need not be fixed. The section title can conform to the title in use in a specific region of the country and the order under a division will be determined by the specific project. This "Composite Numerical-Alphabetical Numbering System" in the arrangement of divisions and sections is flexible and permits any special section or any new trade or practice that is introduced in the future to fit into this system without upsetting the numbering system.

When a project does not contain a specific division, it can be deleted from the table of contents by the words "not included" or "none," and the division numbering remains constant in spite of the omission of a division. Actually, in the specifications, the only place where the division number and title appear is in the table of contents. They do not appear in the body of the specifications, since their function is solely to establish the grouping of the trade sections.

There are certain advantages that can accrue from this system, as one gains familiarity with its use. The system can be used in cataloguing and filing such items as manufacturers' literature, technical data, samples, shop drawings, general correspondence, estimates, lists of manufacturers' names, check lists, and a host of other routine office memoranda.

In addition, once this system becomes standardized, it will enable contractors, estimators, manufacturers, and others who use specifications to find items in the specifications more readily. Under the chaotic conditions that exist today, with specifications emanating from thousands of offices, these same people must cope with the varied systems in use.

Subsequent articles in this column will comment further on this manual.

For information concerning copies of the manual, it is suggested that inquiries be directed to Ron Ryner, Executive Secretary, Construction Specifications Institute, 632 DuPont Circle Building, Washington 6, D. C.

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Year-Round School Operation

BY WILLIAM J. McGUINNESS

Operating schools on a 12-month basis would obviously require mechanical cooling in much of the U.S. This article states the case for air-conditioned schools —in meeting comfort standards even during the present nine-month year, in saving the construction of many new classrooms, and in offering interesting architectural possibilities. The author is a practicing mechanical engineer.

At the close of the school year in June 1961, an article about a 12-month school plan appeared in *The Washington Post*. It referred to the proposal of School Superintendent C. Taylor Whittier for the reorganization — on paper — of several schools in Montgomery County, Maryland, on a year-round basis. To test the reaction of parents and civic leaders and to refine the scheme for possible use, this mock exercise planned for the school year 1961–62 will schedule pupils for periods of three months of study followed by one of vacation. Three-quarters of the students would be in school at one time and would attend for a total of nine months each year, as they do now. The schools would be fully used at all times. At present, the people involved are divided about half-and-half, for and against the scheme. This proposal could be the forerunner of many others having as their objective the better use of school facilities by increasing the capacities of existing buildings by one third.

As in all new plans, there are problems to be solved. One is the elimination of the universally accepted three-month summer vacation. Parents who are in the habit of moving to a summer home may find some difficulty in adjusting. Family vacations of one month or less in which the children are included might be scheduled at times of the year satisfactory to the whole family.

The most important problem, of course, is the maintenance of student and teacher efficiency during the summer months. At any time of the year, the correct classroom temperature range for efficient teaching and learning is 70 to 75 F. It is obviously impossible, in almost all parts of the United States, to maintain this temperature range in summer without mechanical cooling. School boards and the tax-burdened public must be convinced that the cost of air conditioning will not destroy the savings that result from increasing the use of our present schools instead of buying new classrooms.

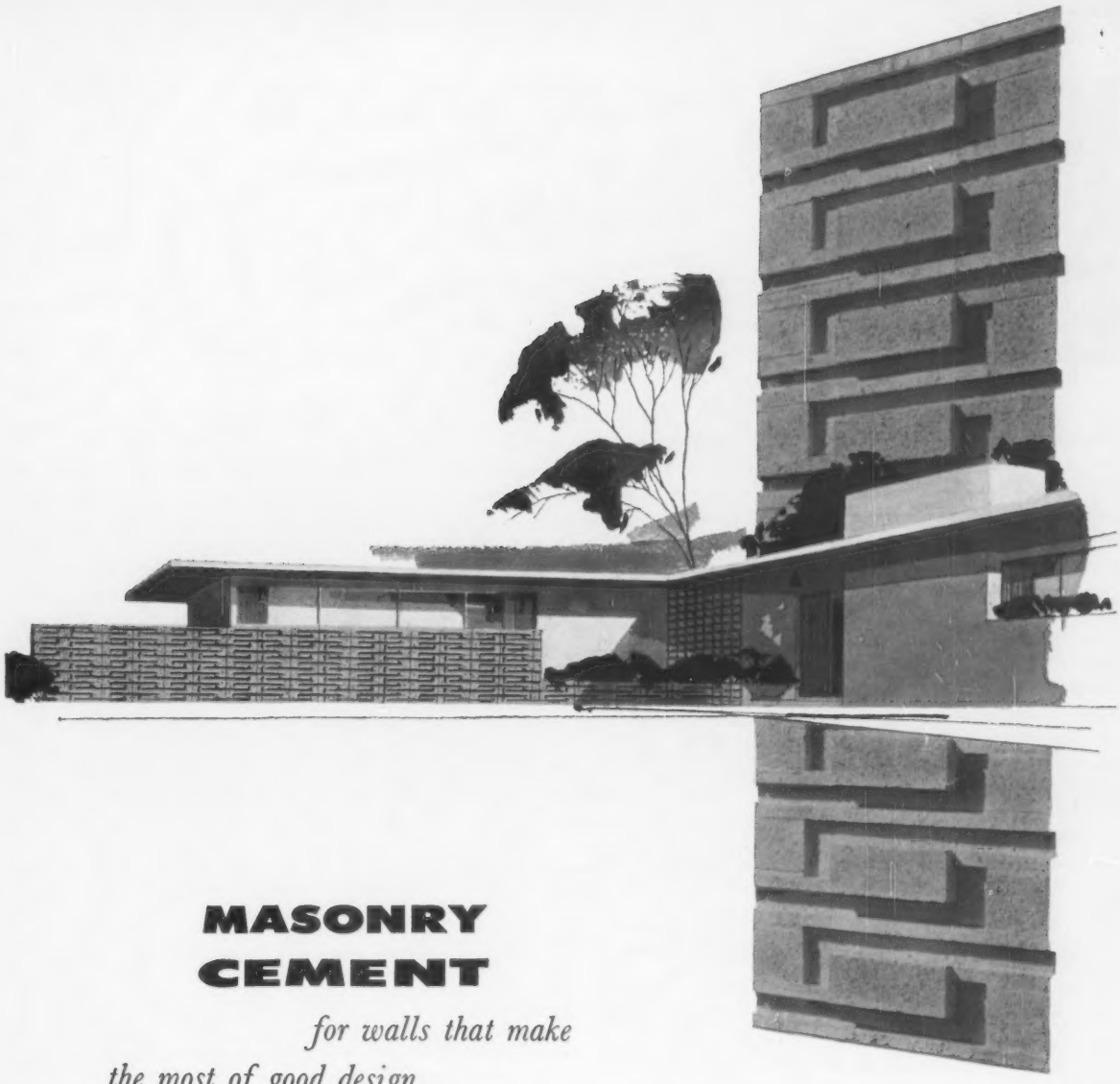
Although there is general agreement that a 75 F classroom temperature should not be exceeded, many do not realize that frequently during the present nine-month scholastic year it is impossible to hold to this upper limit. Classroom temperatures build up quickly from the effects of sun and the body heat of children. The usual method of bringing this temperature down is to pass cool outdoor air through the space. When this inexpensive source of cooling fails, i.e. when the outside temperature is above 60 F, the rise in classroom temperature is uncontrolled. Under the currently standard nine-month program, the percentage of time during which this difficult situation obtains is quite surprising. A list of cities follows, indicating in each case the percentage of time during a nine-month schedule when it is impossible to maintain comfortable classroom conditions by passing outdoor air through the rooms.

City	%	*City*	%
Atlanta	47	Los Angeles	88
Baltimore	38	Miami	97
Boston	25	Minneapolis	25
Chicago	30	New York	36
Cleveland	36	Pittsburgh	36
Dallas	58	St. Louis	45
Denver	36	San Francisco	69
Indianapolis	36	Syracuse	25
Kansas City	47	Washington	40

This list was released by John J. Nesbitt, Inc., manufacturers of heating, ventilating, and air-conditioning equipment. One of its important special interests is the development of systems for the ventilation of classrooms and their temperature control by the use of outdoor air.

From an examination of the list, it is learned that in the normally cool cities of Syracuse, Boston, and Minneapolis, air conditioning with mechanical cooling could be used during 25 per cent of our present school year. In Miami, it would be useful 97 per cent of the time. Most significant is the average of all the percentages (45 per cent) for this representative list of American cities. The consideration of air conditioning to permit summer operation and improve the financial balance sheet may thus have a broader connotation. It could in addition improve academic efficiency during 45 per cent of the teaching time during the months now comprising our school year. If, as many hope, our society is moving away from materialism, this contribution to intellectual improvement would be well received.

Coming now to financial considerations, as one always must, the problem of adding to the budget the expensive item of air conditioning must be met. The cost of adding equipment to existing buildings should be measured against the savings achieved through the curtailment of new expansion. In the case of incorporating it in new construction, savings are apparent in almost every instance. The interesting architectural changes made possible by the new approach contribute not only to economy, but also to efficiency of operation and of teaching and learning. There are many interesting proposals. One of them is the reduction of window area. When considered over the period covering the life-span of the building, windows can cost five times as much as walls. Reduction of heat gains and losses is evident. In large cities, the cost of replacing broken windows alone can pay for the air conditioning. Windowless rooms afford maximum wall and blackboard space, permit greater flexibility in seating arrangements, and make the use of visual aids possible without the drawing of blinds. The absence of dust from open windows reduces cleaning costs. In conventional schools, city noises and those from highways have made some rooms unusable. Air conditioning controls this situation. In planning the site, the architect can take a new view of the criteria for orientation: prevailing winds are less important, new building forms more feasible.



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Mechanic's Lien in New York State

BY JUDGE BERNARD TOMSON AND NORMAN COPLAN

Judge Bernard Tomson was recently called upon to make a judicial ruling in connection with the assertion of a mechanic's lien by a painting contractor in a case for which there was no legal precedent in New York (New York Artcrafts, Inc. *v.* Marvin, et al., *District Court of the County of Nassau, State of New York). Since the determination of whether a contractor is entitled to a mechanic's lien against property for which he has rendered services is dependent upon the statutory law of the state in which the property is located, this ruling would not necessarily be followed in other states. This month's column is devoted to a direct quote from Judge Tomson's decision.*

In this action to establish a mechanic's lien upon the subject property and for money judgments against the several individual and corporate defendants, the parties' stipulation leaves for resolution only the question whether the plaintiff is entitled to a mechanic's lien against the leasehold interest of defendant, Nassau Terminal Bowling Alleys, Inc.

The work performed by the plaintiff consisted of supplying necessary labor, materials, and equipment to patch damaged sections in the defendant's "sprayed fiber acoustic ceilings," to paint the ceiling, and to perform the usual incidental work connected with such an operation. The statute permits a mechanic's lien to attach to a leasehold for a term of years. (See Lien Law, Sec. 2, Sub. 3: "Owner. The term 'owner,' when used in this chapter, includes . . . a lessee for a term of years . . ."). Sec. 3 of the Act grants a lien to a "Contractor, subcontractor, laborer, materialman . . . who performs labor, furnishes materials for the improvement of real property with the consent or at the request of the owner . . ." Improvement is defined in subdivision 4 of Sec. 2 as follows: "The term 'improvement,' when used in this chapter, includes any work done upon such property or materials furnished for its *permanent* improvement . . ."

The precise issue presented, therefore, is whether painting and decorating, and the making of such repairs as are ordinarily associated with painting and decorating, constitutes a "permanent improvement" under the Lien Law of the State of New York. No case has been cited on all fours. There does exist a reference in *The Lien Law of New York* by William L. Snyder, 6th Edition (1916), to "painting" (on pages 14 and 15), where it is stated:

"(b) In this connection, the word 'permanent,' associated with the word 'improvement,' is important. In the absence of this word, any improvement upon realty might authorize a lien therefor. The hired man who mowed the lawn, the farm hand who ploughed the field, or sowed the grain, the gardener who trimmed the trees or cut the shrubbery, might file liens upon the property for his labor. Such services are, however, in their nature temporary, and must be repeated with the recurring seasons. Obviously, services or labor of this character do not constitute 'permanent improvement' of real property within the meaning of the statute. But the term 'permanent improvement' was doubtless intended to include terracing, sodding, dredging, draining, filling and grading, making or repairing sidewalks, *paper hanging, painting*, and the like. Such work is permanent in its character and improves the land for all time, and liens have been sustained for such improvements. *Picket* v. *Tollner* . . . was for sodding and terracing. *National Wall Paper Co.* v. *Sire* . . . was for *paper hanging and decorating. Frederick* v. *Goodman Street Homestead Assn.* . . . was for grading roadways through land to be cut into building plots. *Mosher* v. *Lewis* . . . was for repair to sidewalks."

National Wall Paper Co. v. *Sire*, (*supra*), dealt with a contract which included painting, but which was described as a contract "to make extensive repairs, alterations and improvements in the house"; further, the precise issue determined was whether the owner had given the consent required by the statute. Although the case cited as authority for the proposition does not support it, it would seem that Snyder's conclusion is valid.

Section 23 of the Lien Law provides: "This article is to be construed liberally to secure the beneficial interests and purposes thereof." The cases appear to hold that the requirement for permanence is satisfied if the work, labor, and materials are so incorporated in the structure as to become a part of it. See *Mechanics' Liens, New York*, by Eugene Blanc, Jr., (1949), where on pages 60, 61 it is stated:

"The Courts have not been literal in the requirement of permanence, and properly so, in the light of the Lien Law's general purposes, and of the command for a liberal construction. The result of the decisions is to exclude, on the ground of lack of permanence, two general classes of labor and materials. The first line is drawn between labor and materials which are consumed in or constitute the improvement itself, and those which become a part of the contractor's plant, and are owned by him, and merely used in the performance of the contract."

"The other line is drawn between materials such as steel beams, which permanently support the structure and are clearly a permanent improvement, and, on the other hand, materials such as window shades and bathroom accessories and closet poles, which do not constitute a permanent improvement. There are, of course, many intermediate cases, falling on one side or the other of these lines, such as heavy machinery which is nevertheless removable, but because of the almost unavoidable duplication in some of the definitions of the Lien Law, especially in the definitions of 'improvement' and 'materialman,' further discussion of what constitutes 'material.' (*sic*) . . ."

Measured against the yardstick supplied by the Lien Law and the cases interpreting it, the work, labor, service, and materials here furnished, satisfy the definition peculiar to the Lien Law of a "permanent improvement."

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An Endless House in a Continuous Landscape

Dear Editor: "Thank you, thank you, thank you," I sigh, although still stunned and staggering slightly from the powerful impact of your trend-shattering interview [JULY 1961 P/A] with that "poet laureate" of poetry-art in architecture, "Fritz" Kiesler, who plays upon us, emotionally and intellectually, as did another artist-genius, Fritz Kreisler.

Let us hope some glass fiber company will follow the "concrete" example of the cement people, and commission genius Kiesler and his Associate Bartos, to erect the Endless House at Robert Moses' New York World's Fair—employing extrasensory care in the selection of their *landscape* architects (such as our American Barbara Capen and an equally fine oriental landscape architect to co-operate; they would know how to sense and carry out Kiesler's continuity theme).

Your remarkable interview indicates that Kiesler is attuned to nature, so I implore him to take a good look at page 113 (see above); he surely will be able to perceive how subtly landscaping must be planned to achieve a continued "continuity" theme right up to that dramatic conch-shell entrance-stair. It will be a challenge, and the challenge should not be turned over without deep research.

Timing being everything, surely now is the time, and the World's Fair the place, for "concretely" building this exciting Endless House, and I do hope it will be raised on material which will flow into the luminosity of a stellar adobe, and that the landscaping will enhance its twinkling qualities.

It is in reading a gem like this interview that we glimpse what divinely rare qualities Homo sapiens has, when genius breaks through his earth-bound chrysalis.

KAREN FOSS ZIMMERER
Old Westbury, N.Y.

Soviet Architecture: Metric System and No Mysticism

Dear Editor: I was both delighted and pleased to note your intelligent usage of the modern and efficient *metric system of measurements* in the article "Recent Developments in Soviet Architecture" [JUNE 1961 P/A]. You are to be commended for the fact that you did not apologize to your readers for using the metric system by inserting confusing and complex conversion equivalents in the present antiquated English System of Units (sometimes called U.S. Customary Units).

Please continue to use the Metric System of Units exclusively when reporting foreign architectural news and feature articles of interest in P/A.

JAMES F. ANDERSON
Savage, Minn.

Dear Editor: I enjoyed the article "Recent Developments in Soviet Architecture," and much more your comments about it in the "P.S." column.

Times are changing and it is good that human minds change with them behind the various "curtains" enveloping them. Recently I read an interesting statement from the Soviet Union about abstract art, which as we know is taboo there.

I myself concluded long ago that no one understands so-called modern architecture unless he understands abstract art, because abstract art principles are the bases of the new space concept.

The Soviet statement reads: "Abstract Art leads to mysticism and mysticism leads to religion." No comments needed about religion in the Soviet Union.

I wonder how they will grasp the new space concept "toward establishing a new architectural form." Are they going to gamble with "mysticism" or just simply use clichés borrowed from somewhere as they did in the past with clichés from old classical styles?

ART DAMROSE
Hollywood, Calif.

Nervi in a Strait Jacket

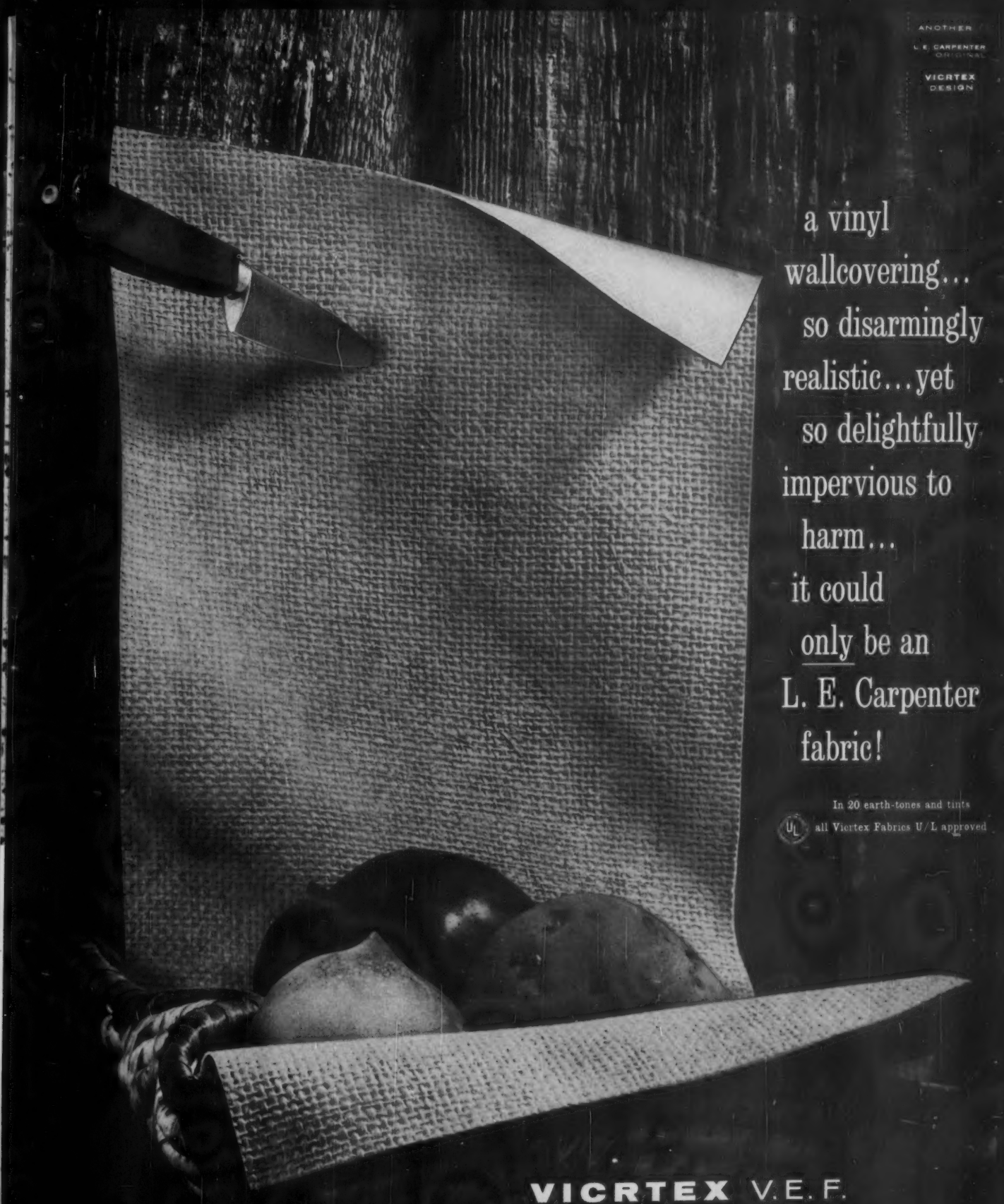
Dear Editor: Your comment on the Dartmouth Field House [NEWS REPORT, JUNE 1961 P/A] was certainly well put. It is good to know that the editors are willing to knock down architects when they fail to perform the proper services of their profession.

PHIL MEATHE
Grosse Pointe, Mich.

The Well-Developed West

Dear Editor: Your usually so reliable publication has been caught with its curtain walls down. In describing the new Los Angeles Water and Power building as "the largest office building in the West," [p. 70, NEWS REPORT, JUNE 1961 P/A] you are guilty of quite an error. The 1,683,405 sq ft include more than 800,000 sq ft of parking.

Among the largest office buildings in the West are the following: Humble Oil & Refining Co., Houston (Offices: 1,450,-



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000 sq ft; Garage: 450,000 sq ft); Los Angeles Custom House & Federal Offices Building (1,200,000 sq ft); Los Angeles County Hall of Administration (977,700 sq ft); Kaiser Center, Oakland, Calif. (Offices: 980,000 sq ft; Shops and Garage: 720,000 sq ft).

I hope this will set the record a little straighter. We are not quite as undeveloped in the West as some Easteners might lead you to believe.

RALPH JACKSON
Director of Public Relations
Welton Becket and Associates
Los Angeles, Calif.

[*P/A pleads not guilty to Ralph Jackson's charge on the basis of information received from his public relations equivalent on the staff of Albert C. Martin & Associates, architect of the building in question. To wit: "It is noteworthy that this building will be the largest office building in the West, and one of the largest in the world." Total square footage was as reported.*—ED.]

Another Pro for the Kahn Story

Dear Editor: I was very interested indeed in Jan Rowan's article on the work of what he calls The Philadelphia School and the philosophy of Louis Kahn in particular (APRIL 1961 P/A). I must commend you on an essay written in such clear and precise English, a habit which is not very common in architectural magazines these days.

ALAN REDFERN
Diamond, Redfern & Partners
Nottingham, England

Wonderful Magazine

Dear Editor: I find that PROGRESSIVE ARCHITECTURE is a wonderful magazine for students studying architecture. It helped me a lot when I went through college, and it will help others who are making their living as architects.

ROBERT G. LAMONT
Tilbury, Ontario, Canada

Brittle Fracture in High-Strength Steels

Dear Editor: I hope that it is not too late to have a short letter published in your magazine for the purpose of clarifying a statement in the article by William McGuinness in the DECEMBER 1960 P/A.

In the article on high-strength steels for buildings, there is a statement that is credited to me to the effect that, regardless of the method of fabrication, the structural steel known as A440 should not be specified "for conditions conducive to brittle fracture, i.e., bending or tension." Taken literally, this would seem to mean that bending or tension invariably constitutes a condition conducive to brittle fracture, which of course is incorrect. Further, it should not be inferred that there was any intent to characterize A440 steel as being unsuitable for bending and tension, in general, when the conditions are not conducive to brittle fracture.

It is true that even under service conditions that are conducive to brittle fracture, members or structural elements subjected to compression are not likely to fail in a brittle manner, whereas under such conditions, tension or tension due to bending could initiate brittle fracture. An unfortunate choice of words, perhaps in the editing of the text of this article, resulted in a wording that has been misconstrued by some readers of the article.

In the same part of the article, which discusses the importance of welding, it is inferred that steels conforming to specifications A242 and T-1 are brittle and have poorer notch toughness, and that greater care is needed for welding these steels than for welding A373 steel. It is true that greater care is needed in the welding of these steels than in the case of A373 steel. However, T-1 steel is generally credited with excellent notch-toughness, and some of the steels furnished to specification A242 likewise have good notch toughness. Other A242 steels are not recommended for welding, especially in greater thicknesses.

The new specification for manganese-vanadium, high-strength, low-alloy steel carries the ASTM designation A441. It has the same mechanical properties as A242 steel, but with a definitely specified chemistry much more favorable welding characteristics are assured than those of some of the A242 steels.

As indicated in the article, A440 steel is not represented in its specification as structural steel for welding. Although this steel can be welded by suitable procedures, without cracking, the characteristics of the as-welded (without subsequent treatment) steel are very likely to be unsuitable for many structural purposes, and it is highly impracticable in the case of structural work to provide a subsequent heat treatment to improve the properties of a weldment.

I hope that this letter will clear up any misunderstanding that has prevailed among some of your readers.

LAMOTTE GROVER
Air Reduction Sales Company
New York, N.Y.

Same Roof, Different Description

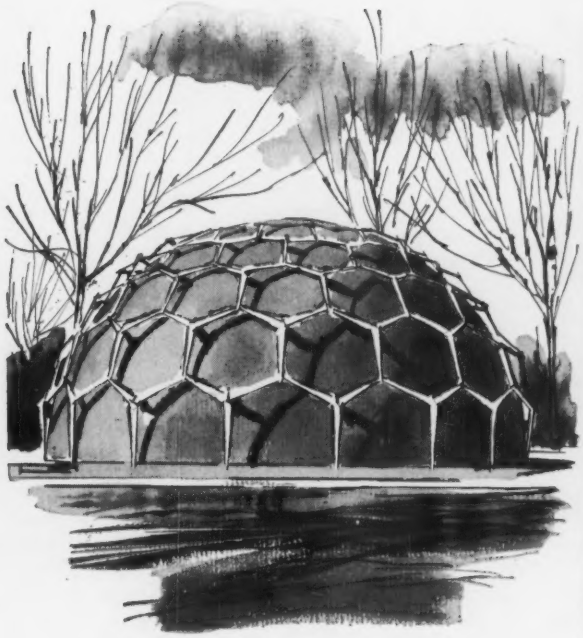
Dear Editor: We were interested to see on p. 51 of the NEWS REPORT (MAY 1961 P/A) a reference to the HQ Building for the Sixth I.U.A. Congress in London. You refer in the news item to a "tetrahedron-roofed meeting hall." May we point out the slight inaccuracy of this description? The roof over the HQ Building, designed by our firm, consists of pyramids of square base, and not tetrahedra.

This structure, which is arousing considerable interest, not only in this country but abroad, has been developed by our firm and a patent has been applied for. This is the second structure of this type that has been constructed using this system: the first is a roof over the restaurant of the Bristol Hotel in Lagos, Nigeria. Several other designs have already been prepared and will be carried out in the near future.

W. STEPIEN
Space Structures Research Ltd.
London, England

Photo: Universal, London

What's News in Rubber...



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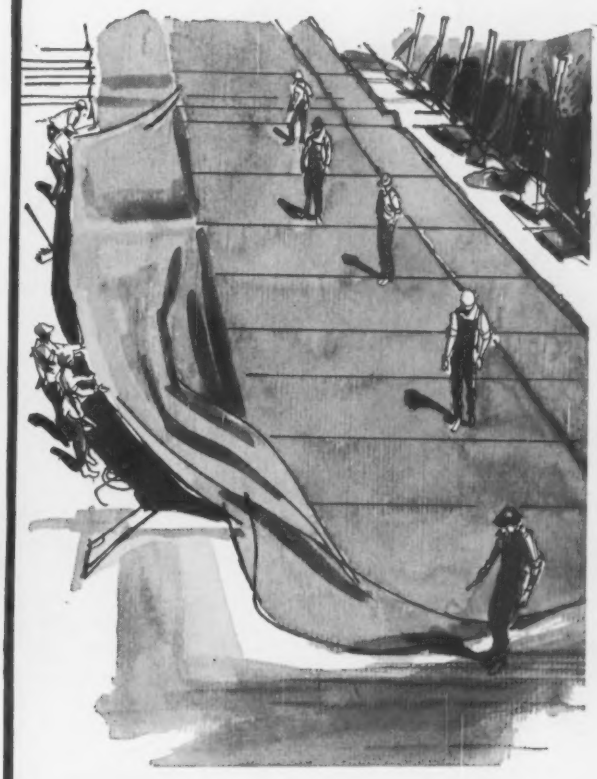

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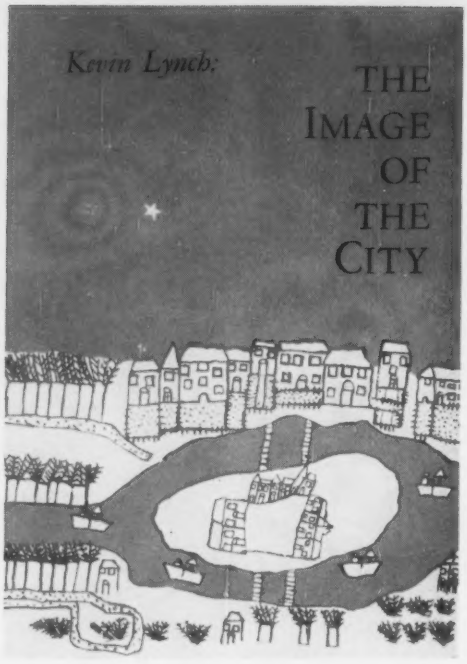


Imageability: A Shock to Architects

BY LEONARD K. EATON
Associate Professor of Architecture at the University of Michigan College of Architecture and Design examines the important consequences of The Image of the City. *Kevin Lynch. The Technology Press and Harvard University Press, 79 Garden St., Cambridge, Mass., 1960. 194 pp., illus. $5.50*

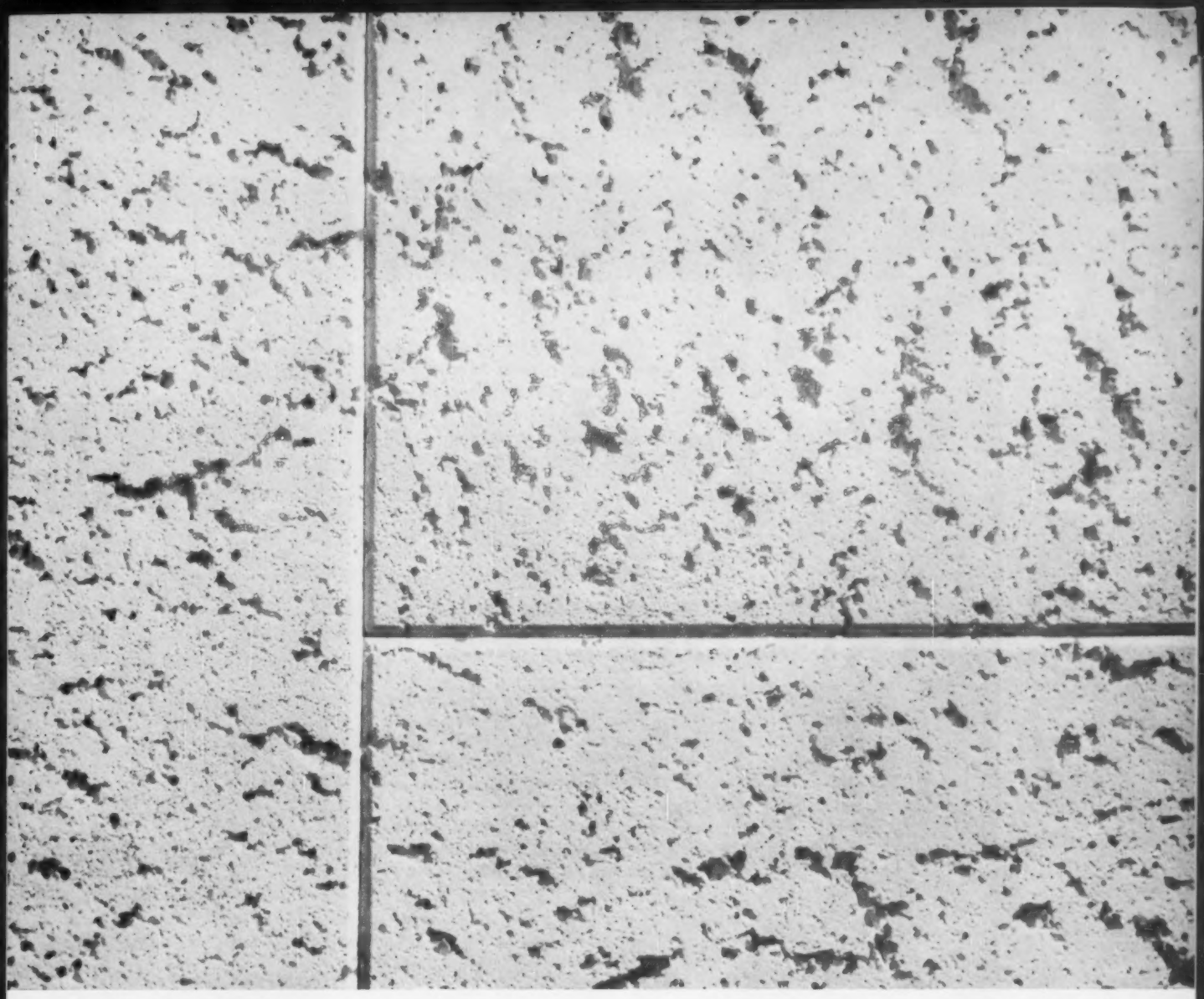
For several years, the concept of the image has been a fruitful one for numerous workers in the social sciences and the humanities. Now Professor Kevin Lynch and an able group of associates at MIT (the chief of whom is certainly Gyorgy Kepes) have applied it to the problem of the urban environment with fascinating results. Professor Lynch, a graduate architect and former student of Frank Lloyd Wright, has done credit to the high aims of the Harvard-MIT Joint Center for Urban Studies in this, its first publication. City planners and urban designers everywhere will be taking account of his work for years to come.

What does Professor Lynch mean by "Image"? Essentially, he refers to the mental picture which people build for themselves of the cities in which they live; he concentrates on one aspect of this picture: clarity or "legibility." Asserting that this quality is of crucial importance for all those concerned with rebuilding our cities, he says it is the major element in the *imageability* of an urban form—"that shape, color, or arrangement which facilitates the making of *vividly* identified, powerfully structured, highly useful mental images of the environment." His central question, then, might be phrased thus: What produces imageability?

To answer this query, Lynch (with praiseworthy empiricism) draws on a variety of intellectual disciplines, such as cultural anthropology, history, literature, and sociology. The chief instrument of his investigations is that time-honored tool of the social scientist, the interview. Selecting three very different urban environments—Boston, Jersey City, and Los Angeles—the author and his associates quizzed a sample of representative citizens on their reactions to the visual and psychological experiences afforded by their cities. "The interview included," says Lynch, "requests for descriptions, locations, and sketches, and for the performance of imaginary trips. The persons interviewed were people who were long resident or employed in the area, and whose residences or work places were distributed throughout the zone in question." The interviews were supplemented by systematic field reconnaissances by trained observers, and in Boston by photographic recognition tests and by requests for direction made of passers-by in the streets. Although he admits the small size of his samples and their bias toward the professional and managerial classes, Lynch modestly contends that ". . . the material is rich in suggestion, and has sufficient internal consistency to indicate that substantial group images do exist and are, in part at least, discoverable by some such means." It should be noted that his text includes a number of fascinating diagrams of his image-cities and many excellent photographs as well. His historical and geographical context is in no way narrow or provincial. He makes numerous references to European cities, and his remarks on Florence, for example, supplement rather than contradict the insights of such earlier observers as Bernard Berenson. His entire frame of reference is, in fact, profoundly humanistic.

Lynch classifies the contents of his group images into five types of elements: paths, edges, districts, landmarks, and nodes. The first four items are self-explanatory, but the last requires comment. "Nodes," he writes, "are points, the strategic spots in a city into which an observer can enter, and which are the intensive foci to and from which he is traveling. They may be primarily functions, places of a break in transportation, a crossing or convergence of paths, moments of shift from one structure to another. Or the nodes may be simply concentrations, which gain their importance from being the condensation of some use or physical character, as a street corner hangout or an enclosed square." Hence, in Boston, the Charles Street Rotary and Copley Square are both nodes. Lynch's discussion of each of his five categories is full of suggestions for everyone interested in the phenomena of urbanism.

Continued on page 232



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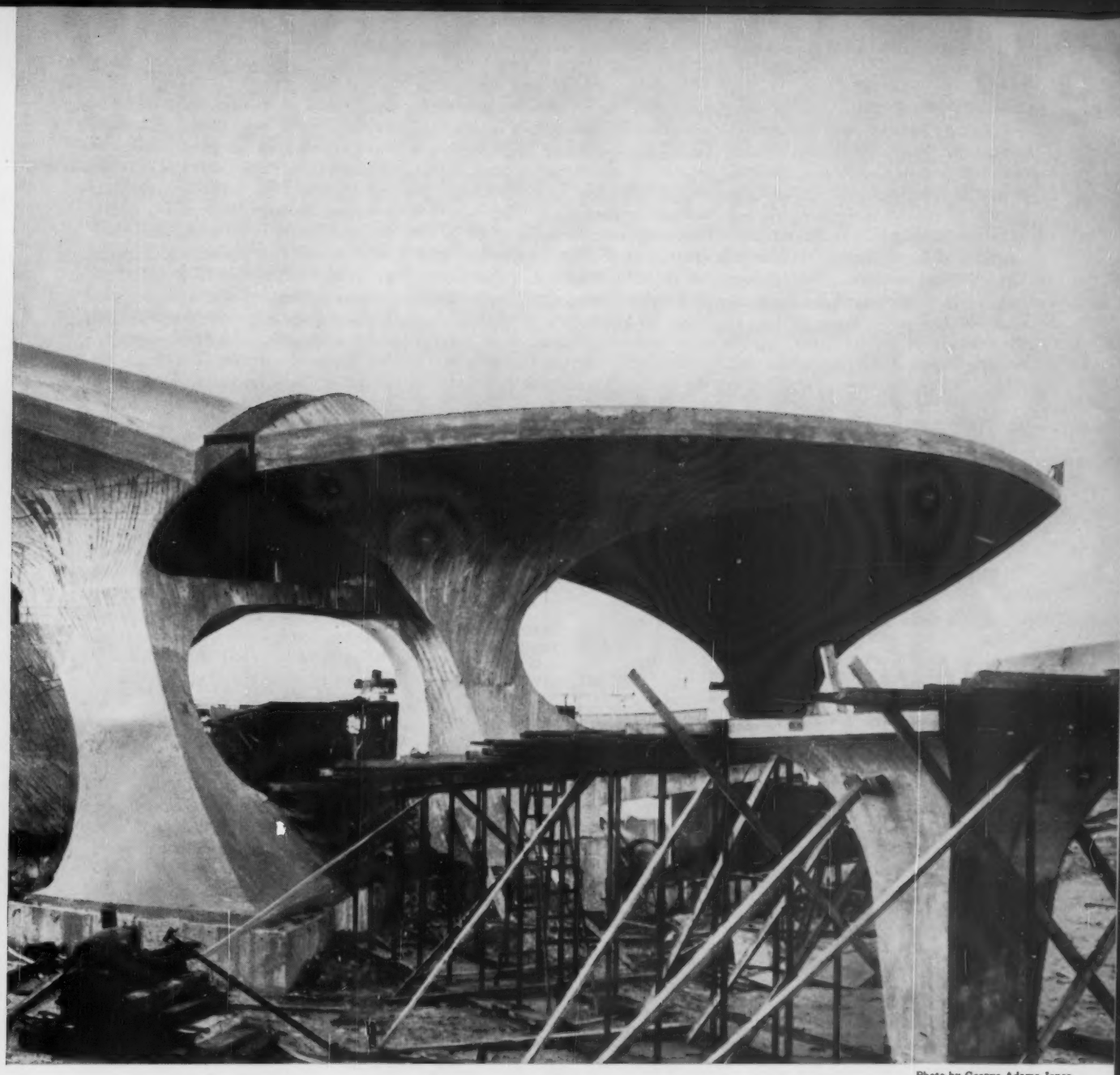

Photo by George Adams Jones

DRAMATIC NEW TRANS WORLD AIRLINES UNIT TERMINAL, Idlewild Airport, New York. Two-and-a-half year project scheduled for completion in late 1961. Four soaring concrete roof shells over 50,000 sq. ft. in area—supported by only four buttresses—weigh 6000 tons, contain 3200 cu. yd. POZZOLITH concrete, and 500 tons steel. Small inset photo is architect's model of completed terminal structure from which walkways connect with two star-shaped departure facilities each accommodating seven aircraft. Architect: Eero Saarinen & Associates • Supervising Resident Architect: Ralph Yeakel • Consulting Engineers: Ammann & Whitney — Boyd G. Anderson, Senior Partner in Charge • General Contractor: Grove, Shepherd, Wilson & Kruge, Inc.—Kenneth P. Morris, Field Project Manager • Testing: Haller Testing Laboratories, Inc.

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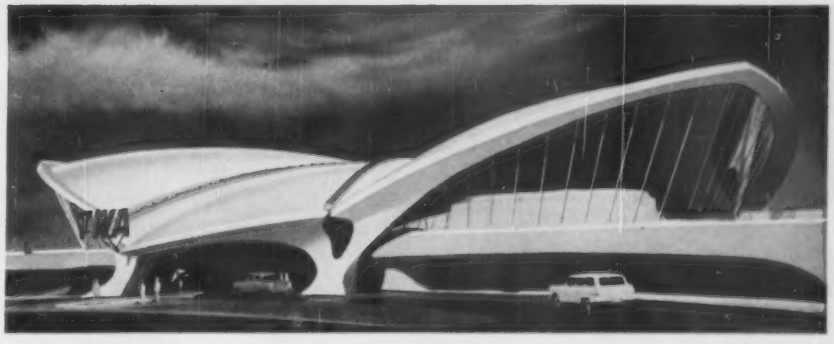

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Continued from page 226

How does he deal with the crucial question of imageability? His conclusions will probably come as a shock to most architects. In general, the strongest reaction of Lynch's respondents was not to buildings but rather to bits of landscape, street furniture, signs, and so on. Thus, the enormous impact of Beacon Hill is not so much produced by handsome old houses as by such factors as the contours of the hill itself, narrow pitching streets, Louisburg Square and its park, trees, and views of the Charles River. The use of brick for pavements, sidewalks, and façades is a unifying factor of great significance. Important buildings, such as Bulfinch's State House, therefore become incidents in an extremely complex entity. They are perceived as constituent elements in the total image, not as independent structures.

The direction of Lynch's thinking is clear. He gives little comfort to those who think of planning as a series of architectural climaxes. On the contrary, the results of his research tend to support the theories of Thomas Sharp and the English "townscape school." According to this view, urban design is a discipline in which the architect works in close cooperation with the landscape architect, industrial designer, and traffic expert. The appearance of such mundane items as street lamps, fire plugs, and garbage receptacles here becomes a matter of prime importance. There is more to the problem, however, than the design of these seemingly insignificant elements. No better illustration of Lynch's approach could be found than his brilliant discussion of Scollay Square, one of the great missed opportunities of Boston. As the author rightly states, "The principal visual impressions of Scollay Square, therefore, are spatial shapelessness, heavy traffic, sharp slopes, and a homogeneity of dilapidation, particular uses, and characteristic inhabitants." He then goes on to analyze the precise reasons for this hideous chaos, concluding that the square has a natural structure not matched in any way by its formal articulation. It could be one of the most striking nodes in the entire city; instead, it is a nightmare. Its imageability is exceedingly low, whereas that of Beacon Hill is extraordinarily high.

The importance of this book in the literature of urbanism is obvious. Ever since the rebuilding of our cities became an urgent matter, planners and architects have been crying out for empirical tools with which to determine exactly what makes a city visually pleasant or unpleasant. For the most part, they have had to rely on the subjective impressions of critics and art historians like Lewis Mumford and Sigfried Giedion. Although the writings of these men have frequently been most helpful, they have lacked the force of objective validation. It is doing them no disservice to say that their insights into urban problems have had much the same quality as those of novelists like Proust and Mann. In short, we have lacked a theory of the city's visual perception based on objective criteria. For some strange reason, in the period dating from the late 19th Century in Germany and lasting until Lynch's efforts at MIT in the 1950's, there was no experimentation in the matter of how cities are perceived. All of us can be grateful for the resumption of this line of thought.

The impact of this volume should be enormous. Now that Lynch has shown the way with Boston, Jersey City, and Los Angeles, there is no reason why his method cannot be applied in other local-

Continued on page 236

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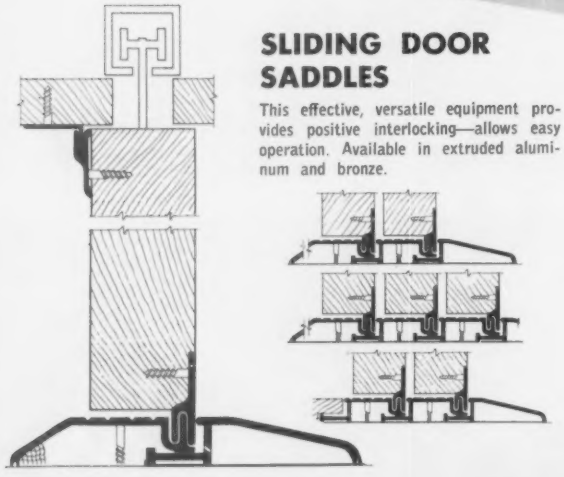

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A Critical Look at Contemporary Home Design—by the Home Owners Themselves!

How well have the houses designed by some of America's best residential architects worn? How well have they actually met the needs of the families for whom they were planned? Here is the *first* book to answer these questions by going directly to the home owners and getting their no-punches-pulled opinions. Written by the editor of *Progressive Architecture*, this lavishly illustrated book is an important report on the successes and failures of certain generally accepted axioms in contemporary architecture.

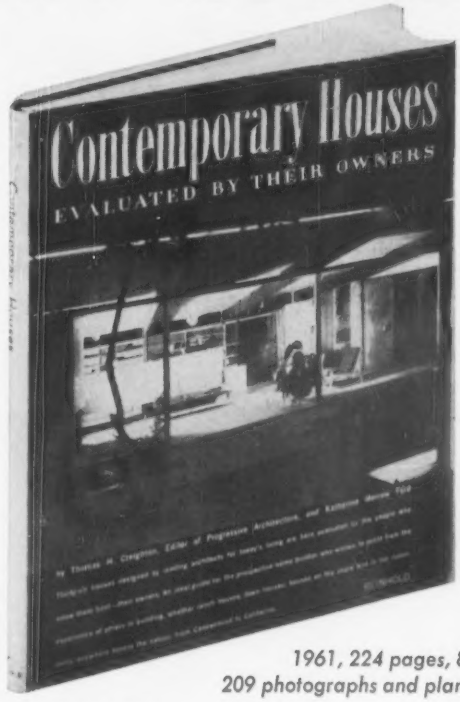
CONTEMPORARY HOUSES:
Evaluated by Their Owners

by THOMAS H. CREIGHTON, F.A.I.A.
Editor of *Progressive Architecture*

Frankly and freely, the owners of 36 custom-designed houses tell what they like—and what they *don't* like—about their new homes. They describe how site plans, room arrangements and materials have worked in homes created by some of America's finest architects. They reveal how the popular concepts of most contemporary home design—open planning, large areas of glass, flexible use of space, natural materials and finishes, and the elimination of architectural "ornament"—have worked in actual practice, day in and day out, during an occupancy of at least several years.

Accompanying the home owners' comments are floor plans, excellent photographs of both interiors and exteriors, and factual descriptions of the architects' problems and their solutions. In his introduction Mr. Creighton analyzes the owners' comments, and draws some perceptive conclusions. Among the many distinguished architects whose works are evaluated by their clients are Richard J. Neutra, Philip Johnson, Mario Corbett, Henry Hill, Olindo Grossi, Minoru Yamasaki & Associates, and Wurster, Bernardi & Emmons.

Here is a valuable, penetrating and often witty look at some of the tenets (and cliches) of contemporary design. Profusely illustrated with both photographs and plans, *Contemporary Houses* is a collection of outstanding homes as well as a critical and analytical report on certain basic concepts of modern house planning and design.



1961, 224 pages, 8¼ x 10¼
209 photographs and plans, $10.95

INTIMATE LIVING

from the Owners' Comments: The house makes for great intimacy in living. In fact, no real privacy is possible. When we entertain on any scale, we park our son elsewhere for the night. Since one of us (my wife) detests the accordion, it is safe for the other (myself) to practice only when he is alone in the house. Our son cannot very well have his friends in at the same time we have ours. However, we enjoy an intimate home life and the limitations are not important....

Location: Berkeley, Calif. Architect: Roger Lee.

DRAMA

from the Owners' Comments: Open planning plus high ceilings plus lots of glass make snow storms and even easterly rains a delight to watch. Having spent 25 years in Colonial design, we feel particularly emancipated.... We are just beginning to find out, however, how useful in actual living the 16-ft. deck will be. Without it there would doubtless be a bad feeling of height from inside the house....

Location: Fairfield, Conn.
Architect: Sherwood, Mills & Smith.

WALLED FOR PRIVACY

from the Owners' Comments: In general the open plan has worked out quite well....The only criticism is that there is little aural privacy in a house of this size. The open bedrooms over the living room area, of course, are not completely private. This presents no problem now, but it may after we have children in the family. For this reason we are planning a completely separated area in the second-story addition at the front of the lot.

Location: Long Beach, Calif.
Architect: Killingsworth-Brady-Smith.

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Architects:
E. L. Mills and Asso

A homelike atmosphere replaces the customary institutional appearance in this Oregon convalescent hospital constructed with versatile West Coast Lumber. The adaptability of wood to the design objective also produced lower cost.

The 76-bed nursing home is built on a framework of West Coast Douglas Fir—2″ x 4″ and 2″ x 6″ wall framing and 2″ x 8″ rafters. Included are 20 two-bed and 12 three-bed rooms, two day rooms, two nurse stations, dining lounge, kitchen and a fully equipped laundry. Total square feet of floor area is 16,464.

A two-hour fire-resistant rated wall, composed of two thicknesses of ⅝″ sheetrock applied to a framework of 2″ x 6″ West Coast Douglas Fir, separates 5,200 square foot units of the building. Exterior masonry at the firewall points satisfies a requirement for extension of fire protection the width of the eaves from ground level.

Colorful stains, applied to 1″ x 8″ Western Red Cedar tongue and groove siding, offer bright, gay accents. Soffits and the underside of the entrance are covered with ¾″ x 10″ cedar bevel siding.

Economy, one of the requirements of this convenient, efficient nursing home, was achieved by a shortened construction period and use of readily available, easy-to-use materials. Results were evident in a lower per-bed cost, and in the fact that owners received patients sooner, and began to receive a return on their investment in a shorter period of time. Similar structures have been built for nursing care and are operating in Texas, Utah, California, Oregon and Washington.

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Continued from page 232

ities. Its use could lead to the making of plans more firmly grounded in visual reality than any we have known heretofore.

Regional Patterns

Regions, Resources, and Economic Growth. *Harvey S. Perloff, Edgar S. Dunn, Jr., Eric E. Lampard, and Richard F. Muth, for Resources for the Future, Inc. Johns Hopkins Press, Homewood, Baltimore 18, Md., 1960. 716 pp., tables, maps. $12.* Metropolis and Region. *Otis Dudley Duncan, W. Richard Scott, Stanley Lieberson, Beverly Duncan, and Hal H. Winsborough, for Resources for the Future, Inc. Johns Hopkins Press, Homewood, Baltimore 18, Md., 1960. 587 pp., tables. $8.50*

These companion volumes comprise an impressive body of research into the economic patterns of modern American life. *Regions, Resources, and Economic Growth* is a survey of the growth patterns of major regional groupings of states (New England, Middle Atlantic, Southwest, etc.). The time span under consideration is, for the most part, the first half of the 20th Century. *Metropolis and Region* focuses attention on major urban centers and their hinterlands, and, rather than emphasizing the changing nature of the metropolis, attempts a study in depth of the situation as it existed about the year 1950.

Starting from these different vantage points, the nine authors have presented a total of 1303 pages of closely reasoned and well—though academically—written analysis. Intended primarily for the serious student of ecology, demography, or regional science, the two volumes constitute a major contribution to their field.

At the risk of grossly oversimplifying, one can state that these books present the relatively familiar scene of a nation where economic development is proceeding at a rapid pace, smoothing out many of the historic differences among its various regions (generally to the benefit of the Far West and the South, and to the detriment of New England). It is within this general context that the secondary pattern—concentration of population and economic activity into great metropolitan agglomerations—should be seen.

DAVID A. GROSSMAN
Advance Planning Associates
Cambridge, Mass.

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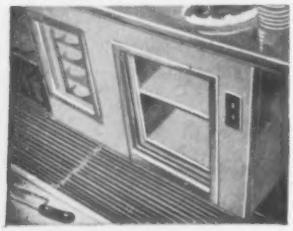

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Fresh Ideas, Added Perspective

Urban Renewal: Official Report of Seminar at The Hague, 1958. Organized by International Federation for Housing and Planning. *Edited by Peter T. van der Hoff. International Federation for Housing and Planning, Alexanderstraat 2, The Hague, Netherlands, 1959. 120 pp., illus. $4 (paperbound)*

During the last 60 years, urban planning has come into prominence. All sorts of causes have contributed to the change of urban areas and have had to be met by planning. This book is the report of a meeting of 32 participants (mostly professional planners, although there were architects, economists, and publicists, too) from 20 countries, who met in The Hague to discuss some of the developments that have occurred in that period and to see what could be done about them.

What is urban renewal? It consists of different ways of action side by side: redevelopment, rehabilitation, and preservation of a city. A great influencing factor on all these is *time*. The conference discussed different methods of re-

Continued on page 246

The fabulous Pavilion—a collection of the most imaginative uses of sculptured block ever seen anywhere. Coordinating architects and Pavilion design—Robert A. Little & George F. Dalton & Associates, Cleveland. Pictured left foreground is a wall of sculptured block by Alfred B. Parker, Miami. The screen to the left by Victor Lundy of Sarasota. The lace-like right screen by Charles Walton of Jones & Emmons, Los Angeles.

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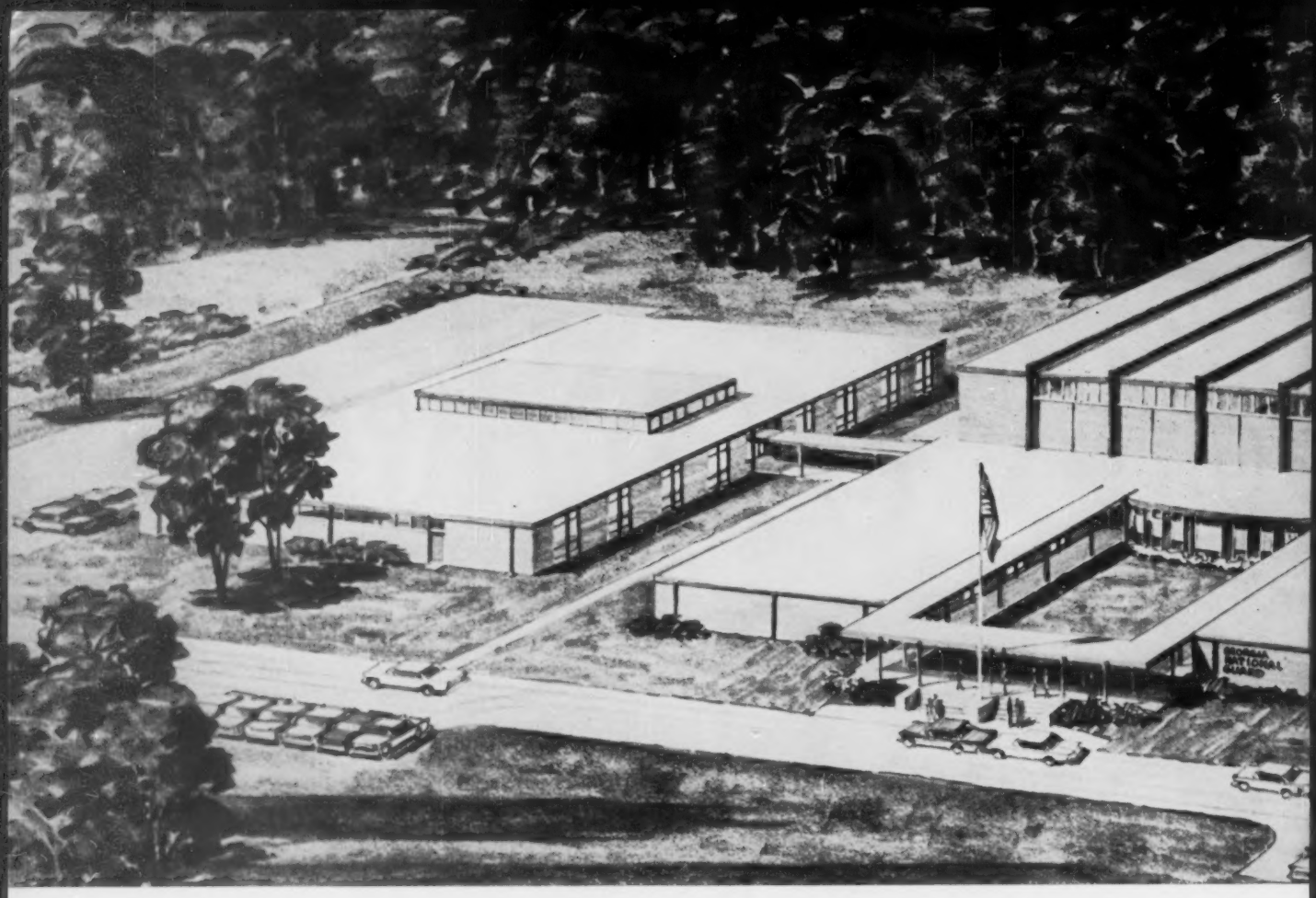


Plastic design of Georgia armory cuts weight of steel frame 15 per cent

Rigid-frame bents spanning 120 feet set new U.S. record for longest plastic-designed clear span

The Georgia National Guard Armory in Savannah, scheduled for completion late this summer, includes three steel-framed buildings linked by covered walkways. The central structure contains two headquarters and administration wings, and a column-free drill hall which will seat 5,000 when used as a sports arena. The two flanking buildings are each large enough to hold four company-size units.

Frames are outside of buildings

Seven 120-ft-long, rigid-frame bents, 20 feet center-to-center, span the drill hall. Clear height is 30 feet. Each of the 15-ton bents was fabricated from 33 WF 152 lb sections, giving a depth-span ratio of 1:44. Eight-inch purlins are framed into the bottom of the wide-flange sections, to expose the major portion of the frame outside the building.

The architects also derived an aesthetic as well as a functional use of the steel frame in the flanking buildings by exposing the columns. These support 12-inch channels which act as a fascia, and 12-inch light beams which frame the roof.

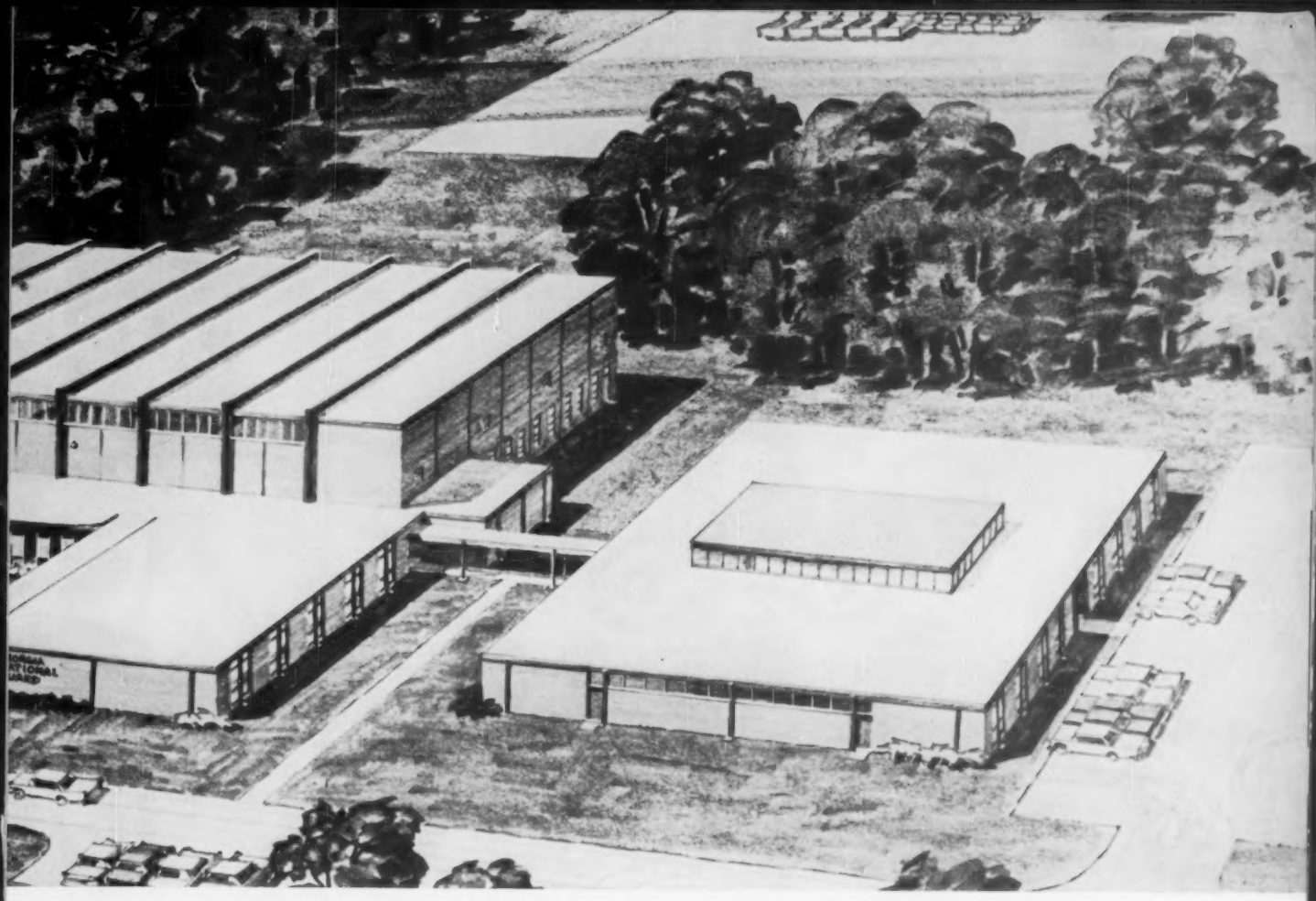
15 per cent savings in steel

By using plastic design, the architects were able to reduce by 15 per cent the amount of structural steel needed to frame the buildings, as compared with the requirements necessary under the elastic method.

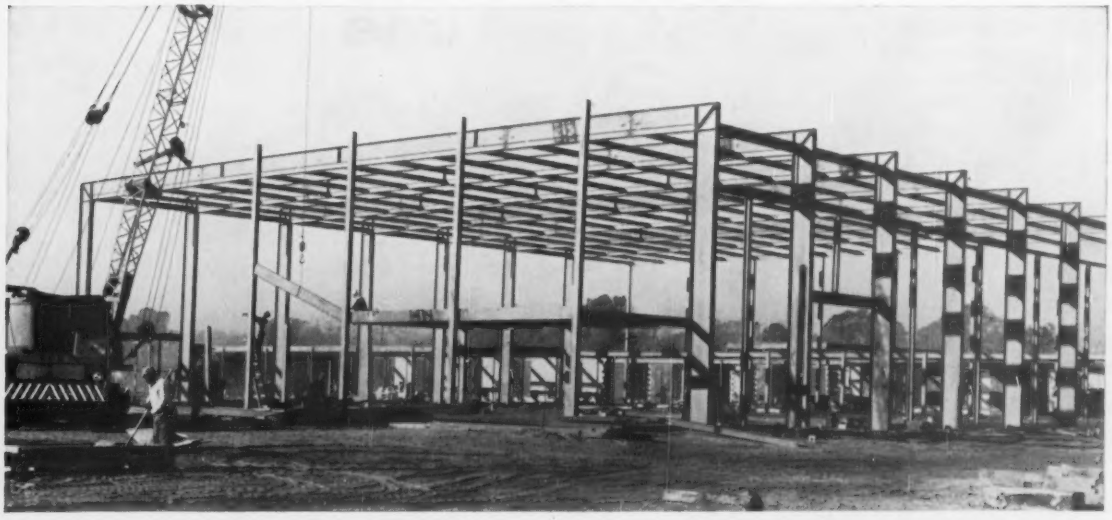
Steel design by the plastic method is a new development in design technique, and generally results in a more efficient structure with less steel required to achieve the same strength. It also saves on the cost of engineering, since it demands less engineering time on the part of the designers.

If you would like a copy of a 10-page AISC booklet on "Supplementary Rules for Plastic Design and Fabrication and Rolled Beam Properties for Plastic Design," write to us at Bethlehem, Pa.

See 26 steel products in action in one plant office! Visit Bethlehem's exhibit at the Industrial Building Exposition and Congress, September 25-28, in the New York Coliseum.



Steel is used extensively throughout the Georgia National Guard Armory, not only as a structural system, but also as frames for windows, canopies, and glass curtain walls. *Architects and Engineers:* Thomas-Driscoll-Hutton. *General Contractor:* Hugh Jackson. *Steel Fabricator:* Owen Steel Company. *Steel Erector:* Steel Erectors, Inc. The major portion of the 310 tons of structural and miscellaneous steel was supplied by Bethlehem.



Light weight of plastic-designed steel frame minimized difficulties created by poor subsoil conditions and led to economies in foundation construction.

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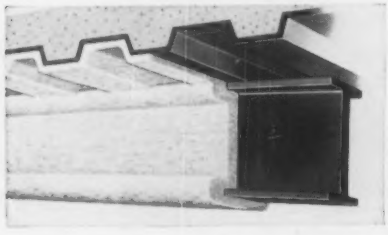
Mono-Kote sprays on, sets firm, dries fast and fissure-free. It bonds to steel at over 500 psf., withstands temperature and humidity changes.



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from left to right:

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Plastering Contractor
George M. Raymond Co.

Material used:
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IBM OFFICE BUILDING

Architect
Charles Luckman Associates (successor to Pereira & Luckman)

General Contractor
McNeil Construction Co.

Plastering Contractor
Travis Corporation

Material used:
Zonolite Fireproofing

3540 TISHMAN BUILDING

Architect
Victor Gruen Assoc., Architecture and Engineering

General Contractor
Tishman Realty and Construction Co.

Plastering Contractor
Martin Bros.

Material used:
Zonolite Plaster fireproofing

TRAVELERS INSURANCE OFFICE BUILDING

Architect
Welton Becket & Associates, Architects and Engineers

General Contractor
George A. Fuller Company

Plastering Contractor
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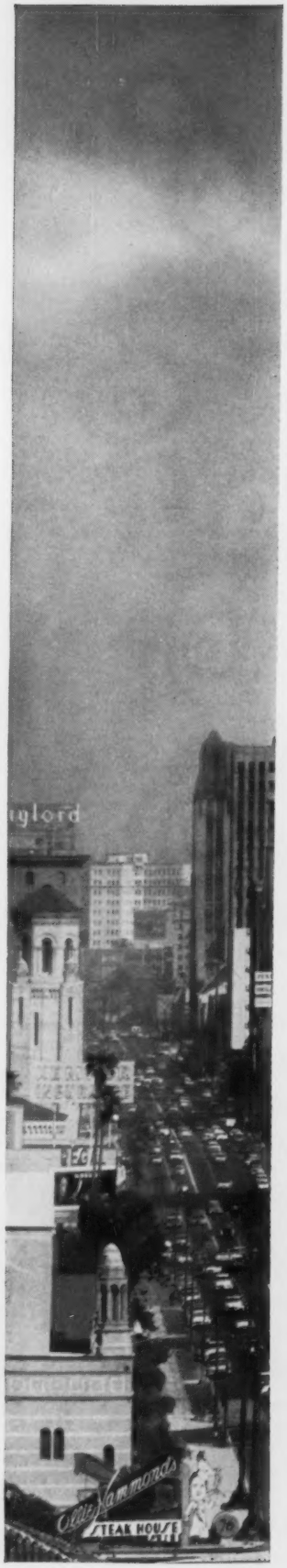
Material used: Zonolite Mono-Kote direct-to-steel decking fireproofing; Zonolite Plaster for fireproofing columns, shafts, stairwells.



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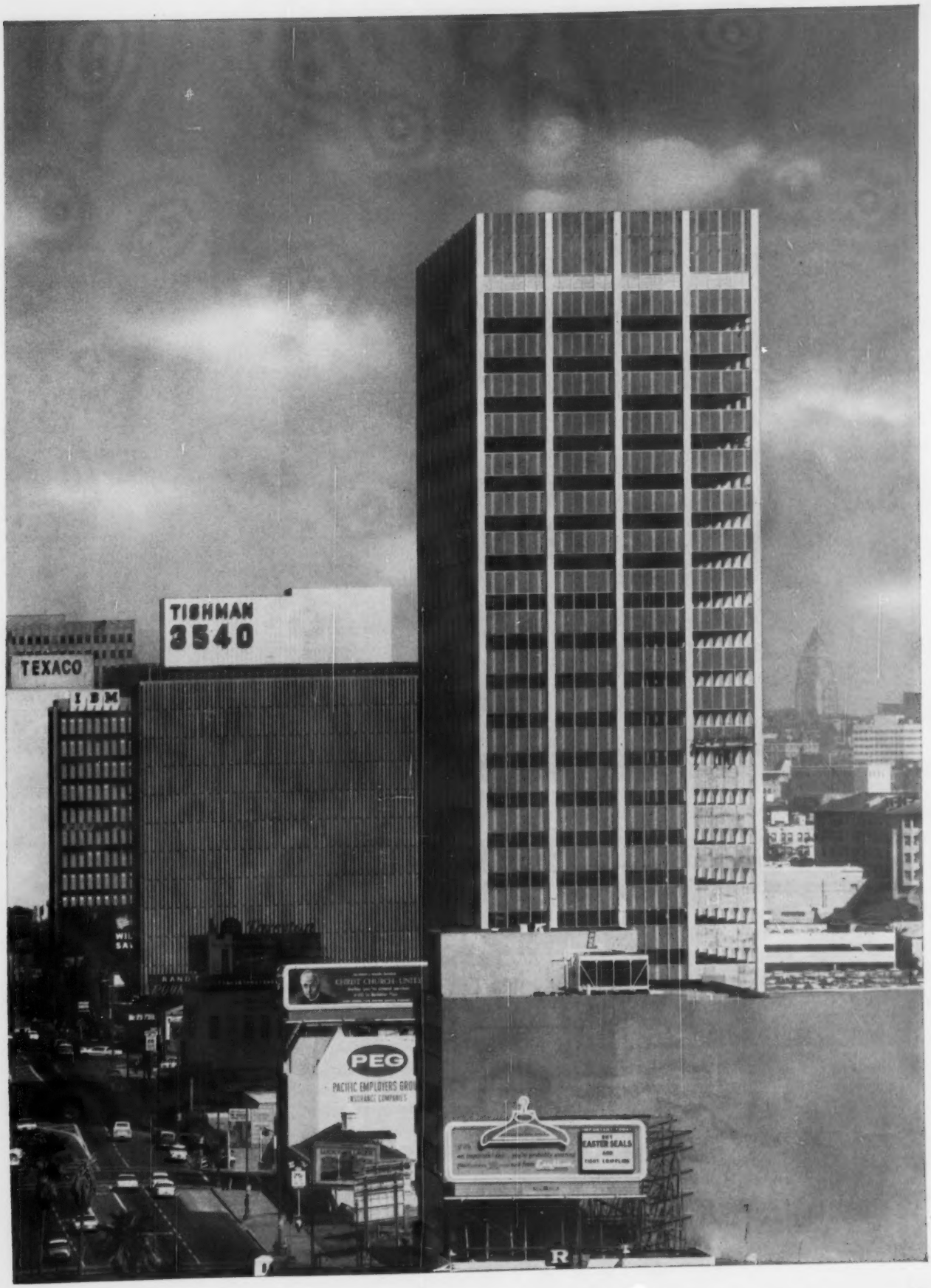
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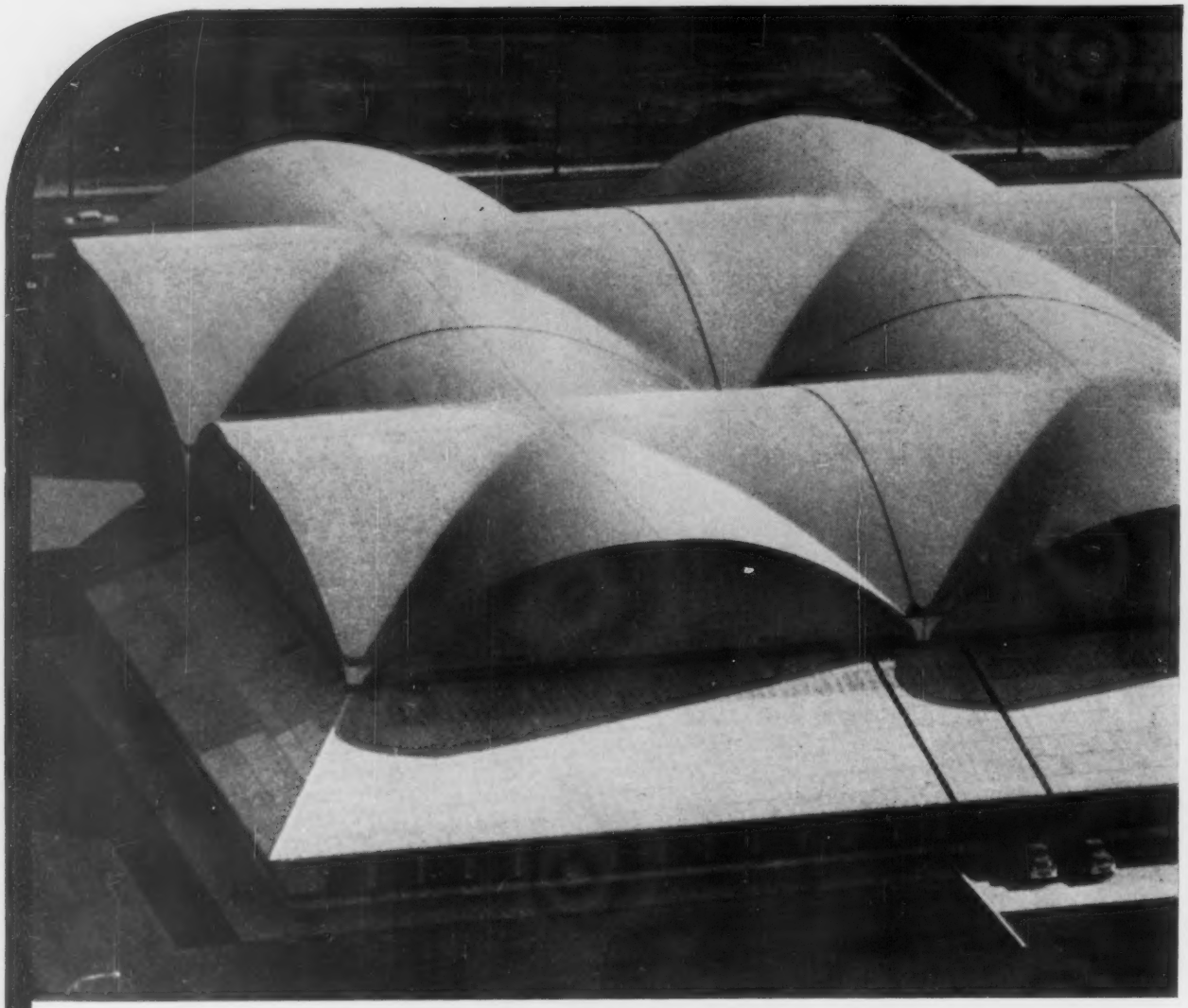


The "OVERHEAD DOOR" opens

Automatic doors speed mail delivery in first fully-automated post office—offer fast, safe, low-cost methods for efficient materials handling in most modern buildings.

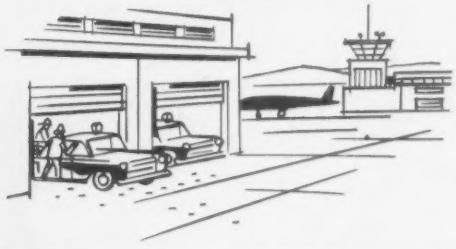
"OVERHEAD DOORS" that open and close *automatically* complete the new automated post office in Providence, R. I., shown above and at left. "OVERHEAD DOORS," equipped with explosion-proof electrical operators, integrate with the modern electronic design to insure safer, more efficient handling of mail. Altogether, 59 "OVERHEAD DOORS" are used.

In many applications—especially with the present trend to automation—automatically operated "OVERHEAD DOORS" can help you plan for more efficient movement of materials and vehicles to save time, motion and heat loss. The doors can be operated electrically with a switch, button or pull cord placed at any point inside or outside a building. Or they can be operated electronically with a radio signal from the vehicle, to provide the convenience and flexibility of remote control.

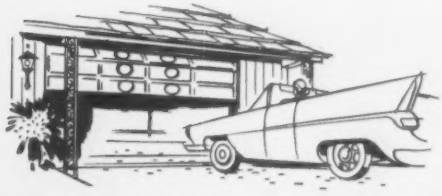
Architect-Engineer: Charles A. Maguire Associates, Providence

A few of many problems solved with electronic control

Faster Loading, Unloading. Small radio units give fork-lift truck drivers remote control to open and close doors they must pass through many times each day. Time saved in stopping, getting on and off truck and waiting for door to operate, can greatly reduce materials handling costs.



Airport Emergency. Combining electronically operated doors with emergency alarm signals saves valuable seconds for many airport fire stations. A signal from the airport tower simultaneously opens doors, turns on lights and triggers alarm bells in fire station often located at other end of airfield.



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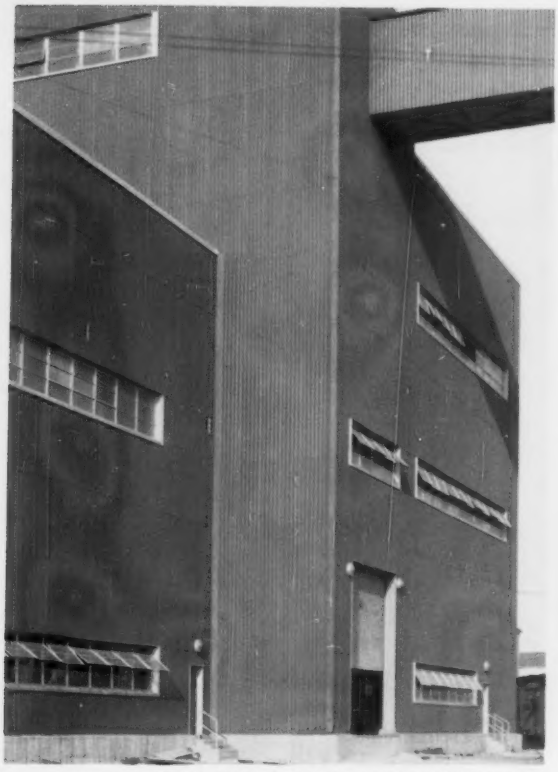

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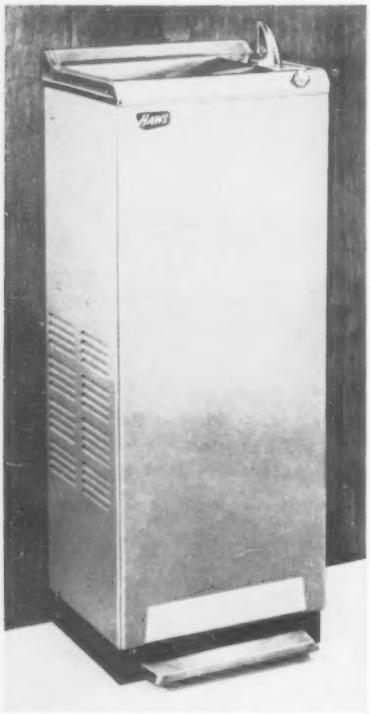

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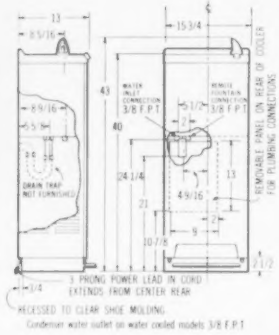

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Continued from page 236

newal used in the several countries, from all-out Government control in some, to the private business of the "redeveloper" in the United States.

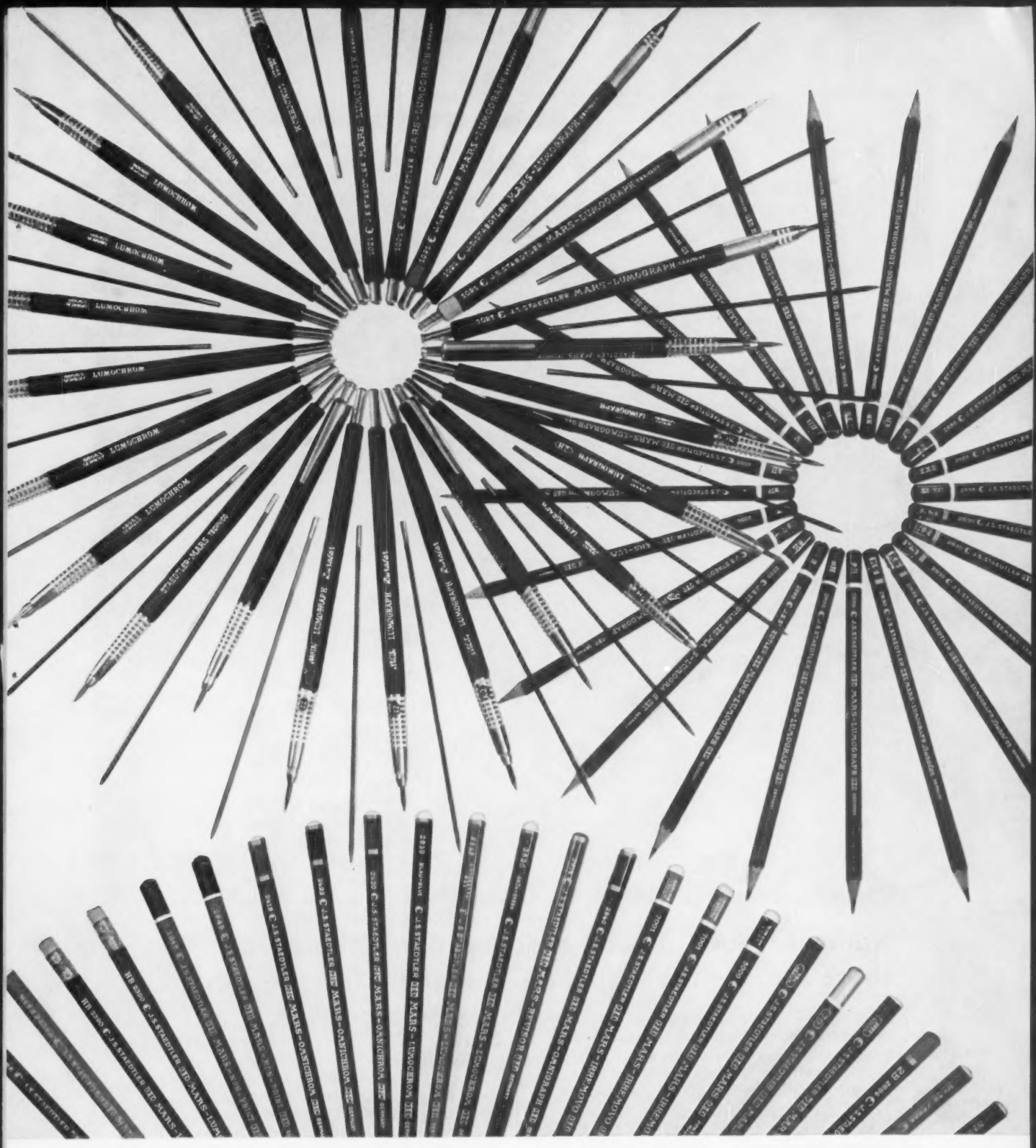
One of the most interesting working sessions of the conference was that on circulation. The conclusions were: (1) planning of central areas should seek to eliminate the automobile only to a limited extent, because to do more would suggest a policy of defeat; (2) the ring road, or concentric road, provides the best principle for the collection, interception, dispersion, and diversion of traffic; it serves best for the handling of the bulk of traffic; it affords maximum opportunities for speeding up traffic in urban areas; and although its use involves a circuitous route, this is not undesirable if distance is measured in time, not miles; (3) the necessary public and political acceptance could be achieved more readily if a direct measuring device for stressing the terrible cost of traffic congestion were developed; and (4) the separation of pedestrian and vehicular traffic is highly desirable, with pedestrian malls providing a good solution to shopping-area circulation problems.

Problems of area appraisal were reviewed in another working session. An interesting suggestion was that a periodically renewable certificate of maintenance be issued to all buildings, along with a certificate of occupancy. Furthermore, it was suggested that where full clearance operations in large projects would take from four to five years, or more, some of the dwellings in more serviceable condition be fixed up temporarily for occupancy for a limited period. Care should be exercized, however, as such structures tend to be used far beyond the "temporary" period.

It was noted that in countries like the Netherlands, every square meter is planned and used in the interests of the national economy. Urban renewal projects should conform with, and elaborate upon, general area plans. Both the general city plan and the general plan for physical development of the urban region should be placed in the context of the internal economy, the political traditions, and human values to which the people adhere. Initiative should stem from responsible local authority. Renewal action often provides the only action that produces life in the urban center. Everything should be considered —down to the smallest detail of street furniture. Urban renewal projects should

Continued on page 252

For more information, circle No. 406 ➤



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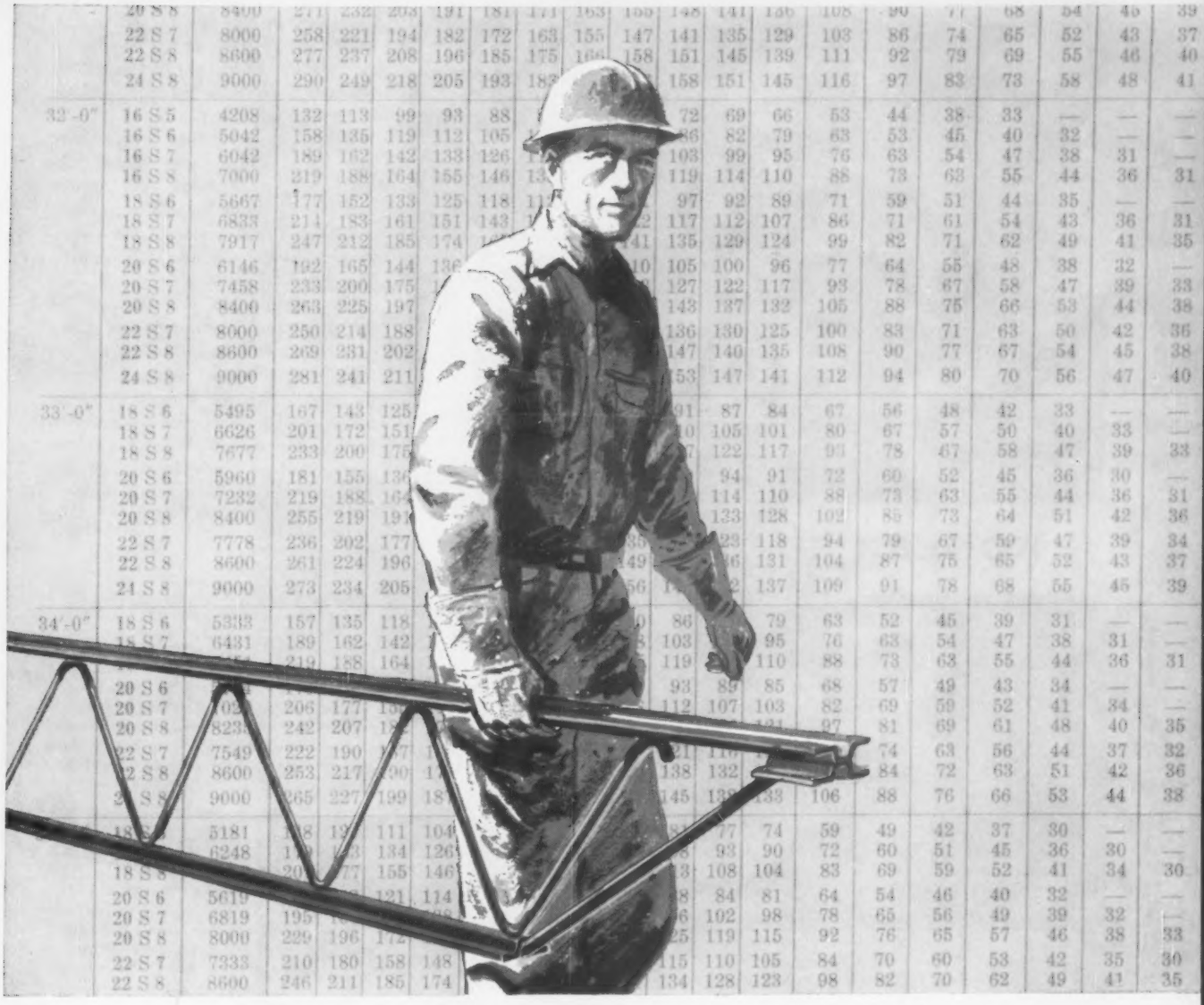

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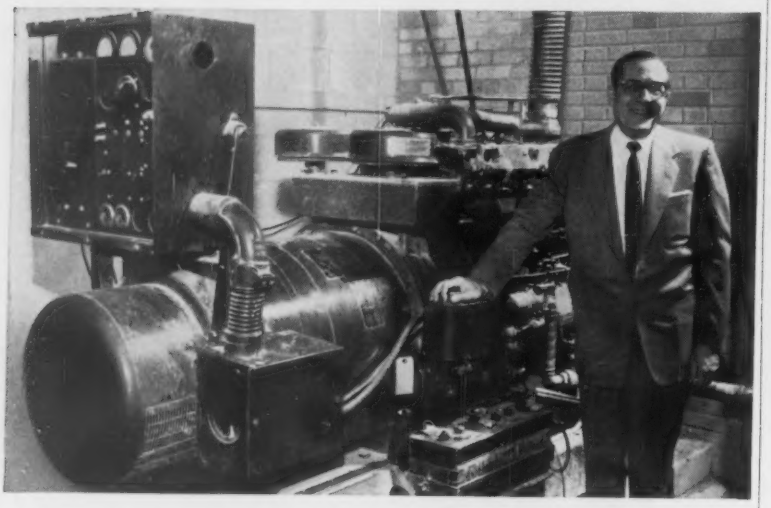

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Continued from page 246

include the provision of new housing on the outskirts of the city to suggest rehabilitation and conservation toward the center of the city.

After the conference, there were study-tours of three major Dutch cities —The Hague, Rotterdam, and Amsterdam. The report on Rotterdam was most enlightening, and contained much case-data that could be applied to our American renewal programs.

The book is bound in a soft cover and the print and illustrations are either quite small or I have reached the age where spectacles are required. Despite the presentation, which could have been better, and the shape, which makes it hard to store on a bookshelf, the volume contains many fresh ideas that give added perspective to our own work.

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OTHER BOOKS TO BE NOTED

Braque. John Richardson. New York Graphic Society, Greenwich, Conn., 1961. 110 pp., illus. $12.50

Color reproductions of work from all periods of Braque's development. The text quotes liberally from the artist's writings and conversations on the sources and aims of his lifetime of experimentation.

Ethiopia: Illuminated Manuscripts. Jules Leroy, Stephen Wright, and Otto Jaeger. New York Graphic Society, Greenwich, Conn., 1961. 98 pp., illus. $18

The fifteenth volume of the UNESCO World Art Series, presenting an almost unknown art form: the illuminated manuscripts of the medieval Coptic church of Ethiopia. The strange and colorful iconography is reproduced in full-page, full-color plates.

Archipenko: Fifty Creative Years 1908–1958. Tekhne Publications, 143 W. 20 St., New York 11, N. Y., 1960. 346 pp., illus. $20

A panorama of many of Archipenko's aesthetic inventions that have become the foundation of modern sculpture. Text includes writings by the artist and 50 art historians on such subjects as his theory of creativeness as a phenomenon of cosmic energy, and the development of creative consciousness by individuals. More than 300 plates.

A Selection of Engraved Crystal by Steuben Glass. Steuben Glass, Fifth Ave. and 56 St., New York 22, N. Y., 1961. 86 pp., illus. $15

Large black-and-white reproductions of 40 major pieces produced by Steuben in recent years. Appendix gives short biographical sketches of the artists.

Graphic Design in Architectural Renderings: Compiled from International Competitions. Idea and layout by Gerd

Continued on page 258

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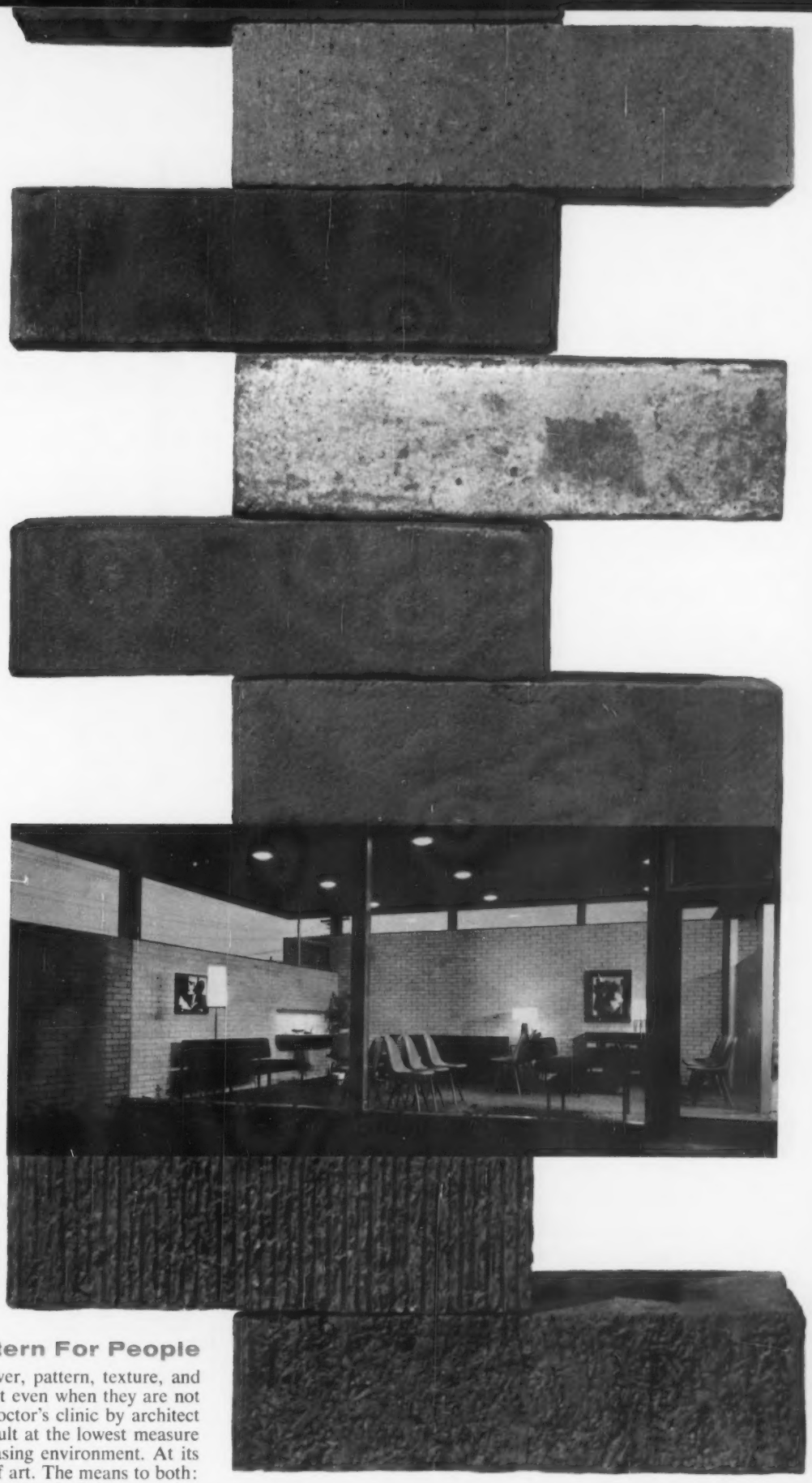

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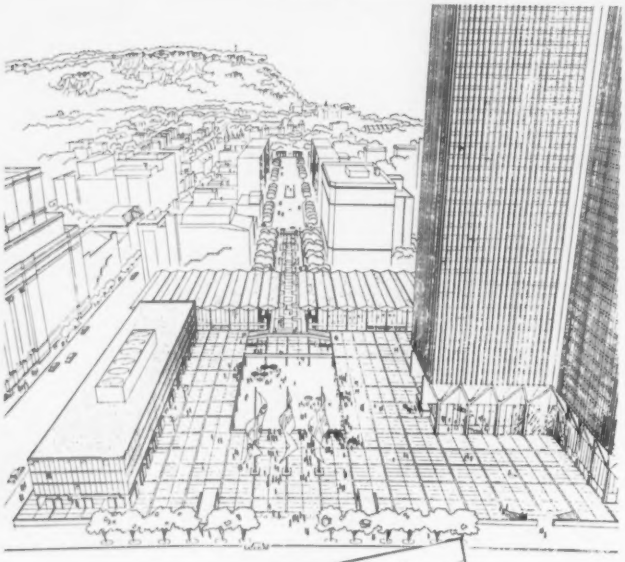

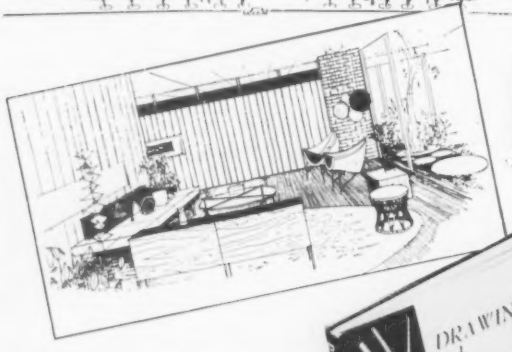

1961, 160 pages, 8¼ x 10¼, approx. 150 illustrations, $8.95

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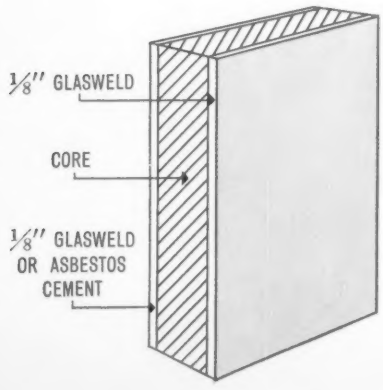

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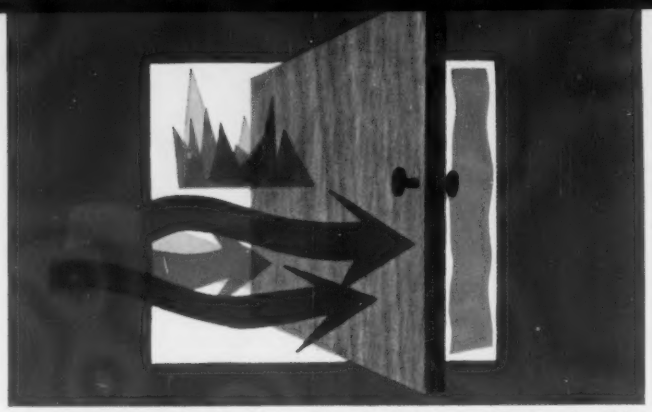
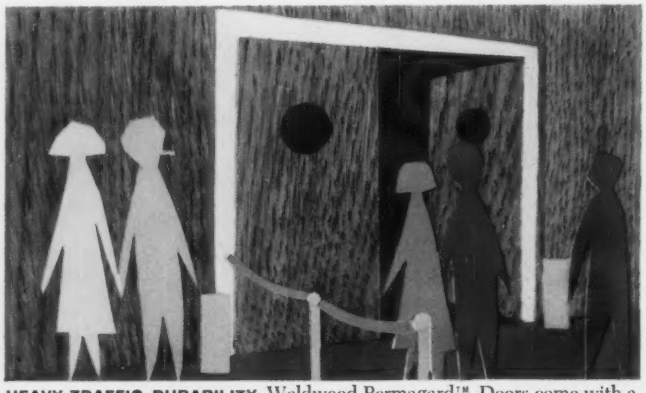
Weldwood® Doors—with faces, cores, and constructions to fulfill every building requirement—now come cut to fit your openings, machined to fit your hardware, and finished to meet your specifications. The performance of each Weldwood Door is guaranteed, in writing, by United States Plywood.

Weldwood Algoma-Made Doors assure the architect of the exact finish he prefers and permit him to maintain critical control of door hanging with greatly reduced labor and handling costs. For 16-page catalog describing the complete line of Weldwood Doors, see your Sweet's File, or mail the reply card.

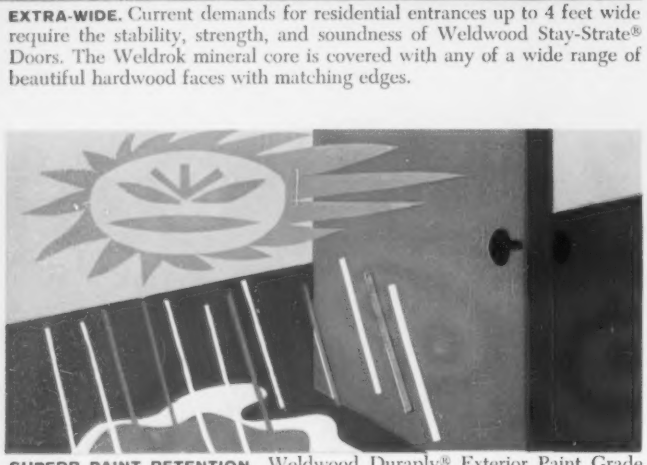


FIRE PROTECTION. Weldwood wood faced Fire Doors, with incombustible Weldrok® cores, stop both flame itself *and* destructive heat. Doors available rated and labeled by Underwriters' Laboratories, Inc., for Class "B" (vertical shaft) and Class "C" (room and corridor partition) openings.

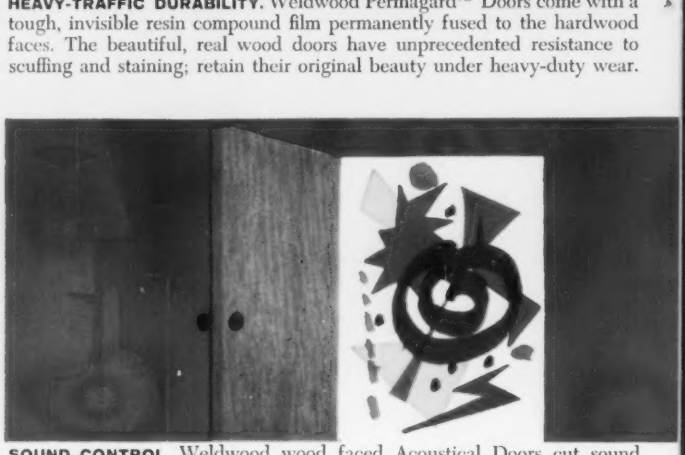
EXTRA-WIDE. Current demands for residential entrances up to 4 feet wide require the stability, strength, and soundness of Weldwood Stay-Strate® Doors. The Weldrok mineral core is covered with any of a wide range of beautiful hardwood faces with matching edges.



HEAVY-TRAFFIC DURABILITY. Weldwood Permagard™ Doors come with a tough, invisible resin compound film permanently fused to the hardwood faces. The beautiful, real wood doors have unprecedented resistance to scuffing and staining; retain their original beauty under heavy-duty wear.



SUPERB PAINT RETENTION. Weldwood Duraply® Exterior Paint Grade Doors need only 2 coats of quality paint for colorful, all-weather beauty that lasts up to 5 years. Overlaid with tough, resin fiber that assures you a perfect paint surface and minimizes paint failures.



SOUND CONTROL. Weldwood wood faced Acoustical Doors cut sound transmission from 35 db to 51 db. Highest db cut represents doors hung double in opening. As beautiful and easily hung as any Weldwood flush door, they are priced far below earlier types of sound-retarding doors.

Send for free data booklets

☐ "Weldwood Caswell" – gives detailed drawings, specifications, and physical characteristics.

☐ "Weldwood Architectural Doors" – new 16-page booklet gives specifications, detailed drawings on the full line of Weldwood Doors.

Name.....

Firm.....

Address.....

City.....Zone.....State.....

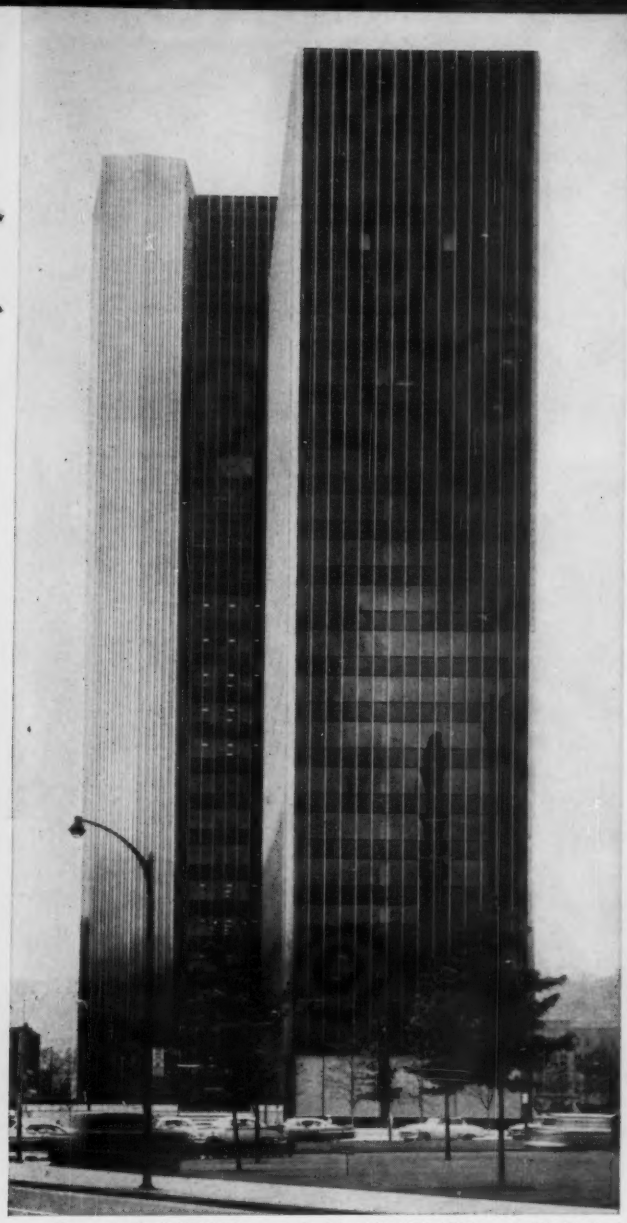
Algoma-Made Custom Royal Door – with rugged, colorful Micarta® faces.

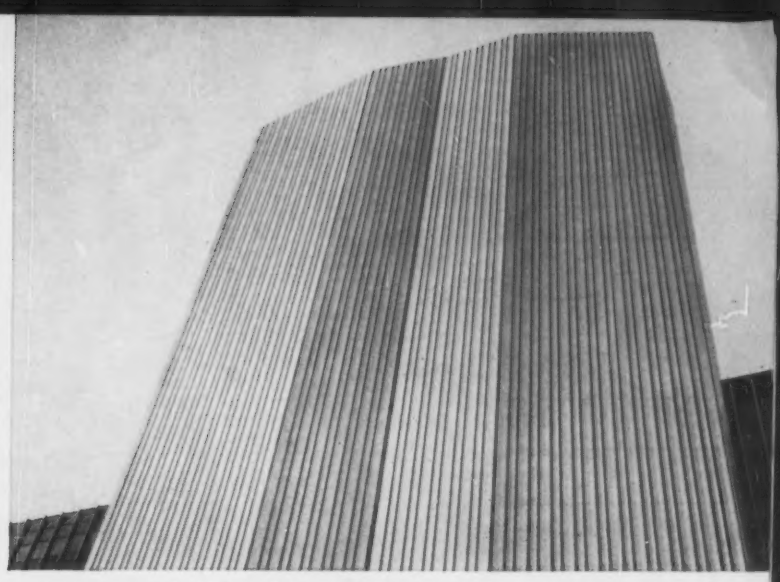
Algoma-Made Staved Lumber Core Door—all-purpose door for interior/exterior residential, industrial, and institutional uses.

Algoma-Made Special Purpose Doors – Metal Clad Flush, X-Ray (lead-lined), Louver, Hospital (with stainless steel stretcher and kick-plates).

WELDWOOD DOORS

Products of United States Plywood





From any angle, Nickel Stainless mullions and external service tower give this new 22-story building top-to-bottom beauty. Interesting design note: colored Nickel Stainless strips are used on the service tower for strong vertical emphasis.

Owner: The Equitable Life Assurance Society of the United States • Architects: Harrison & Abramovitz • General contractor: George A. Fuller Co. • Curtain wall fabricator and erector: Limbach Co.

New building keeps full floor space on every level with outside service tower of Nickel Stainless Steel

In Pittsburgh's new Four Gateway Center Building, The Equitable Life Assurance Society of the United States gets 400,000 square feet of virtually uninterrupted floor space. All 22 stories are left uncluttered, thanks to an external service tower that houses all elevators, mechanical and electrical equipment.

The windowless service tower, completely sheathed in Type 302 Nickel Stainless Steel, gives a strong vertical emphasis. This is accentuated by Type 302 Nickel Stainless mullions that run top to bottom on the main building in combination with colored glass.

This new building shows how architects can use the versatility of Nickel Stainless Steel to effect their own ideas of modern design. Here are four reasons why architects choose this gleaming metal.

Competitive in cost. Its high strength-to-weight ratio means that lighter sections can be used, generally at an initial cost competitive with ordinary building metals.

Easy to maintain. Nickel Stainless is probably the easiest of all architectural metals to keep clean. It resists pitting from the atmosphere, and its surface stays so smooth that rainfall alone helps keep it clean.

Lasting good looks. High corrosion resistance means long-lasting beauty for the life of the building. And Nickel Stainless resists unsightly staining from adjacent materials, such as other metals, brick, or mortar.

Easy to fabricate. Nickel Stainless forms and fabricates easily. It punches, shears, and welds readily. New roll-forming methods can often mean important fabrication economies.

More information about Nickel Stainless Steel? Write for the 32-page booklet, "Architectural Uses of the Stainless Steels."

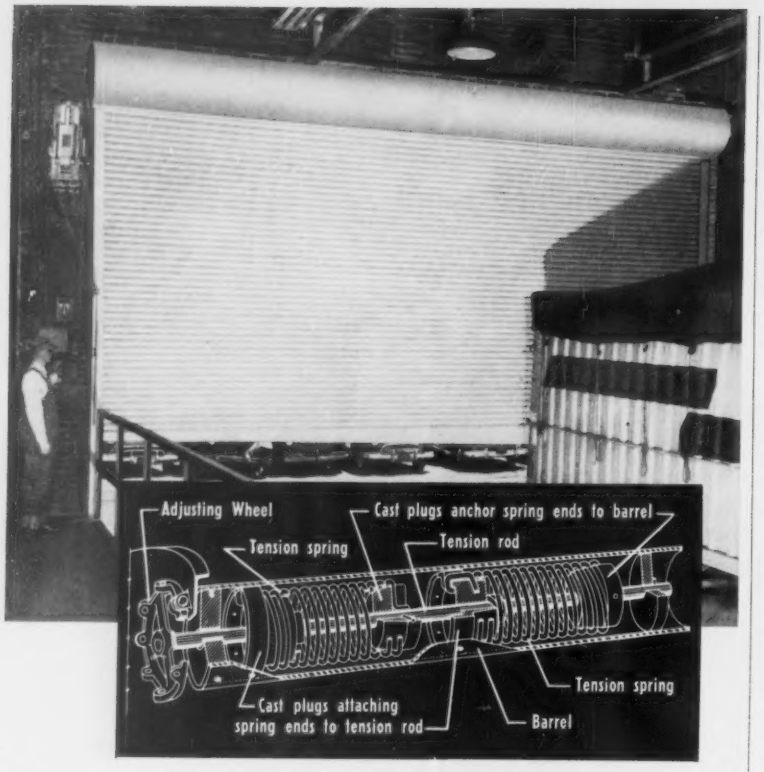
THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street INCO New York 5, N. Y.

INCO NICKEL

NICKEL MAKES STAINLESS STEEL PERFORM BETTER LONGER

For more information, circle No. 365



There's a "Barrel of Difference" in Kinnear Rolling Door Quality!

"Longer door life at lower cost" — so often noted by users of Kinnear Rolling Doors — is due to extra strength and quality built into every feature, *including the unique counterbalance system "hidden" beneath the door's hood!*

As illustrated above, special cast plug devices anchor one end of each spring to the barrel, and to the other end to the tension rod, which extends through the door bracket into the adjusting wheel.

No disassembly required to adjust total curtain tension

The adjustment wheel turns all springs an equal amount, in the same direction. The ideal counterbalance action is quickly and easily arrived at, without any disassembling, and tension is always equal on each spring, at all points of curtain travel. This assures maximum service life for the door and its complete counterbalance mechanism.

Every Kinnear Rolling Door is REGISTERED for your protection

Here's "life extension" that protects your Kinnear door investment far into the future: Full details of every door are kept in fireproof vaults. In case of accident or mishap, new parts are always quickly available for any Kinnear Door — no matter how long it has been in use!

Add these advantages to the fact that no other type of door saves so much usable floor, wall and ceiling space—nor combines so much all-metal protection with quick, complete, jamb-to-jamb doorway clearance—than Kinnear Rolling Doors. The result explains why Kinnear Doors are so widely preferred in industrial, commercial and institutional buildings of every type. Write for complete information on Kinnear Rolling Doors!

KINNEAR® ROLLING DOORS
Saving Ways in Doorways

The KINNEAR Mfg. Co.
FACTORIES:
1900-20 Fields Ave., Columbus 16, Ohio
1742 Yosemite Ave., San Francisco 24, Calif.
Representatives in All Principal Cities

For more information, turn to Reader Service card, circle No. 369

Continued from page 252

Zimmerschied. Verlag Interbuch, Berlin, 1960. Distributed by Renouf Publishing Co., Ltd., 2182 St. Catherine St., W., Montreal 25, Que. 176 pp., illus. $15

A direct-from-practice, stylized presentation of human figures, animals, trees, and cars in simple graphic form. Published to resolve a problem that worries architects, draftsmen, and students—the decorative finishing touch to a purely technical design. The handling of trees and human figures is done exceptionally well, whereas animals and cars are somewhat exaggerated; as a whole, the book has numerous examples to incite the designer to use his own initiative.

Indian Art in America: The Arts and Crafts of the North American Indian. Frederick J. Dockstader. New York Graphic Society, Greenwich, Conn., 1961. 224 pp., illus. $25

The first comprehensive work to consider the North American Indian as a serious artist and to understand his aesthetic values within the framework of his own culture and resources. Represented are shell and quill work; pottery and weaving; hide painting; carving in wood, stone, and ivory; masks and costumes of every region, from the woodland League of the Iroquois to the Eskimo hunting grounds of the Arctic. The author is Director of the Museum of the American Indian in New York, the largest collection of its kind in the world. Many of the 250 illustrations are in color.

Planning and the Urban Community. Edited by Harvey S. Perloff. Carnegie Institute of Technology and University of Pittsburgh Press, Pittsburgh 13, Pa., 1961. 235 pp. $4

Carboni: Exhibitions and Displays. (Second Edition). Erberto Carboni. New York Graphic Society, Greenwich, Conn., 1959. 218 pp., illus. $13.50

Photographic record of the ingenious display work for international fairs and special exhibitions by the world-famed Italian designer.

Palms. Desmond Muirhead. Dale Stuart King, Publisher, Six Shooter Canyon, Globe, Ariz., 1961. 144 pp., illus. $1.95 (paperbound)

A study of palms in landscape: Their origin, identification, cultivation, and use. Illustrative material includes line drawings by the author, who is a city planner and landscape architect.

Compilation of ASTM Standards on Cement. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 1961. 288 pp. $4

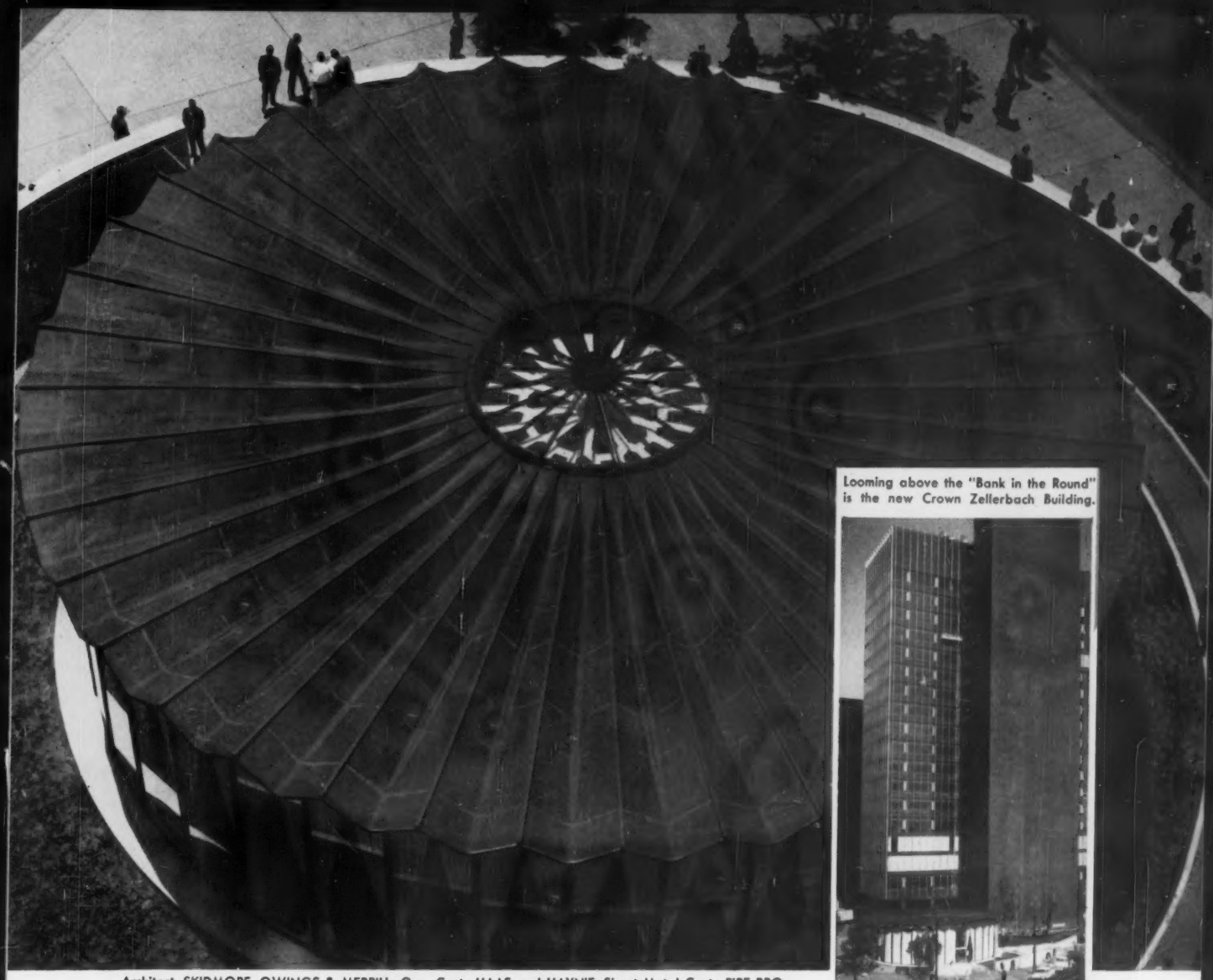
Revisions and additions to the previous edition. Volume includes eight specifications, 26 test methods, and definitions.

Boilers: Types, Characteristics, and Functions. Carl D. Shields. F. W. Dodge Corp., 119 W. 40 St., New York 18, N.Y., 1961. 559 pp., illus. $15

A basic reference covering all aspects of its subject, the result of years of experience and research by a noted consulting engineer.

School Fires: An Approach to Life Safety. Building Research Advisory Board.

Continued on page 262



Looming above the "Bank in the Round" is the new Crown Zellerbach Building.

Architect: SKIDMORE, OWINGS & MERRILL: Gen. Cont.: HAAS and HAYNIE: Sheet Metal Cont.: FIRE PROTECTION PRODUCTS. Revere Distributor: PACIFIC METALS COMPANY, LTD. All of San Francisco, California.

"Bank in the Round" a striking example of the great freedom in design that is possible with

REVERE COPPER

The "pleated" roof on the new Wells Fargo Bank American Trust Company building in San Francisco, Calif., is the result of an unusual design problem faced by the architects.

When they designed this ultra modern "Bank in the Round" they knew that many people would be looking down on it from the adjoining skyscraper in addition to those viewing it from the street level. The roof, therefore, could not be an ordinary one. Nor could the bank have a rectangular profile and still stand out against the tall building next to it.

The solution was the "pleated" roof you see above. It contains 12,000 lbs. of 16 oz. cold rolled Revere Copper, in 36″ x 96″ and 36″ x 120″ sheets. Copper was chosen to achieve this unusual roof because of its virtually unlimited flexibility in design, its eye-catching appearance (which takes on a striking patina as it ages) and its ease of workability into any desired shape or form.

This is another example of how the architect can dare to be different with copper because copper is so cooperative with his ideas, giving him practically unlimited freedom of design. A good reason to design your present and future structures with Revere Copper in mind.

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Founded by Paul Revere in 1801

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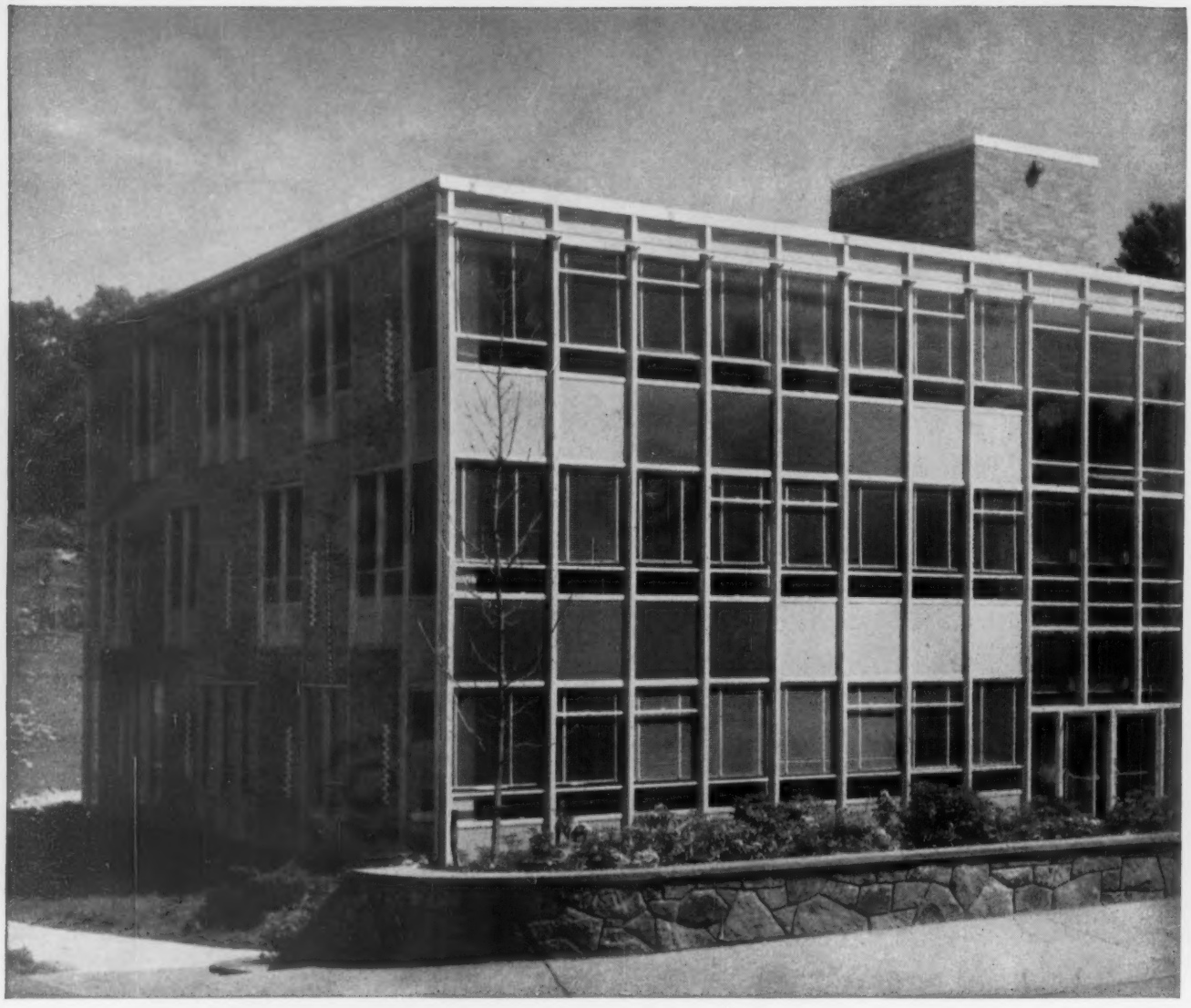
Mills: Rome, N.Y.; Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles, Riverside and Santa Ana, Calif.; New Bedford and Plymouth, Mass.; Brooklyn, N.Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities.

Distributors Everywhere

For more information, turn to Reader Service card, circle No. 394



LUPTON aluminum curtain walls create striking patterns in color at Yonkers' new Walt Whitman Junior High School

The bold, imaginative use of colors and patterns . . . in interiors and exteriors . . . is the most dramatic feature of ultra-modern, new, three-story Walt Whitman Junior High School, Yonkers, N.Y.

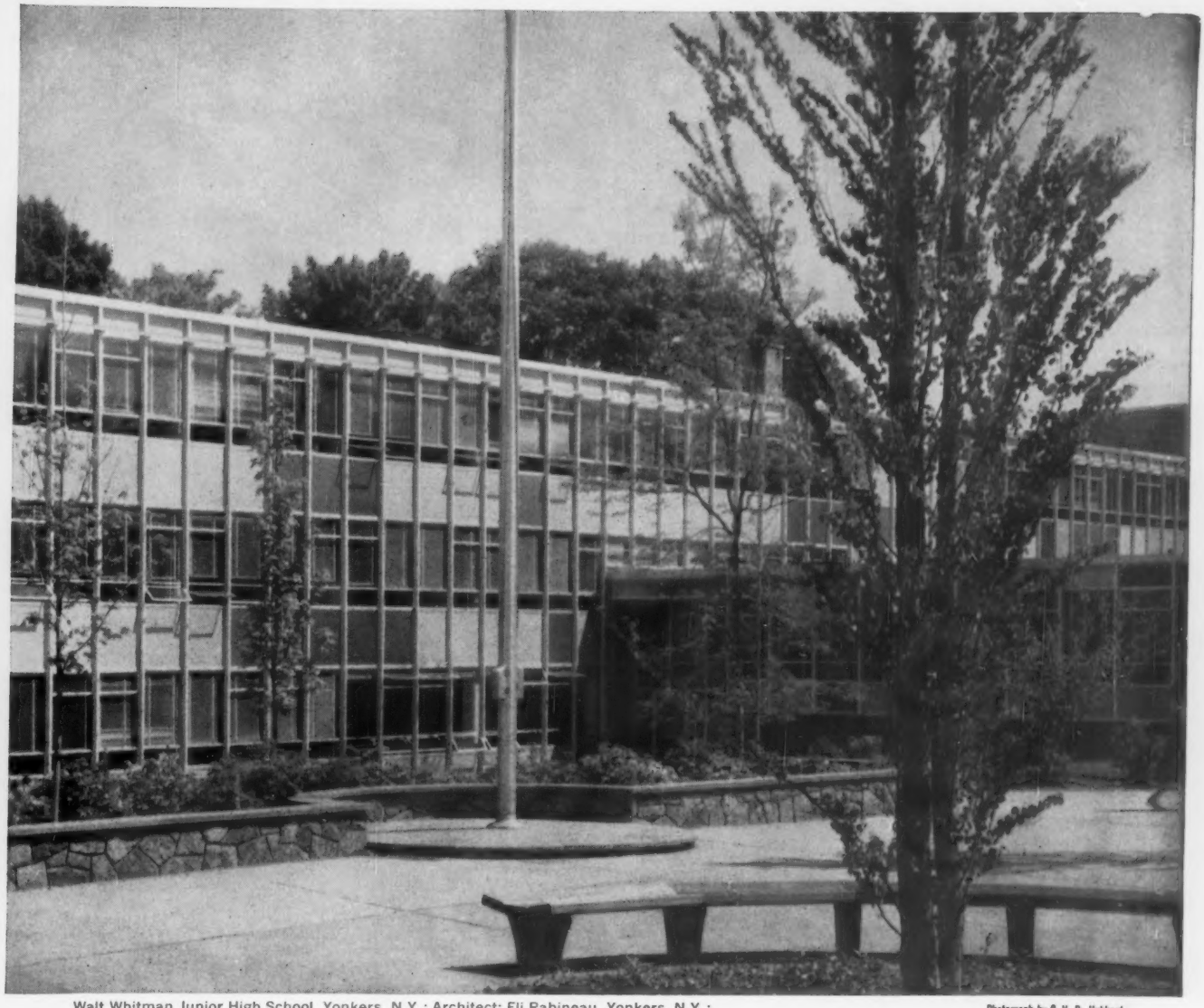
On two sides of the building, the architect utilized LUPTON Aluminum Curtain Walls . . . their spandrels forming attractive random patterns of several colors.

The Walt Whitman Junior High School illustrates the exciting design possibilities for you inherent in LUPTON Aluminum Curtain Walls. A wide range of colors, windows in various styles, panels of metal or glass allow you unlimited creativity in design. This handsome modern wall construction provides striking visual effects when used alone or with brick, stone, and other materials.

LUPTON Aluminum Curtain Walls and Windows offer you such dollars-and-cents features as: low initial cost, virtually no maintenance, and effective thermal insulation (two metal skins form a built-in vapor barrier).

Installation is worry-free because LUPTON assures you of accurate fitting and alignment of all component parts. It offers you a single source of responsibility for both the manufacture and the erection of the entire assembly.

See the LUPTON Aluminum Curtain Wall and Window Catalog in Sweet's (sections 3 and 17).Then talk to your local LUPTON man or write to us for details.

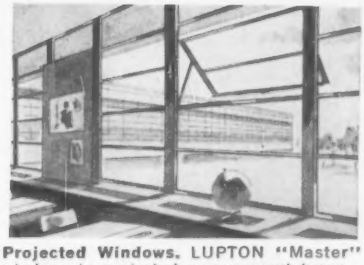


Walt Whitman Junior High School, Yonkers, N.Y.; Architect: Eli Rabineau, Yonkers, N.Y.; Engineers: Abrams & Moses, New Rochelle, N.Y.

Photograph by C. V. D. Hubbard

OTHER LUPTON PRODUCTS THAT MAY SOLVE PROBLEMS FOR YOU ARE:

Double Hung Windows. LUPTON DH-A2 aluminum double-hung windows are custom built for installation in masonry construction or metal curtain walls. Woven-pile weatherstrip and barrel type suspension give smooth operation and weathertight closing.



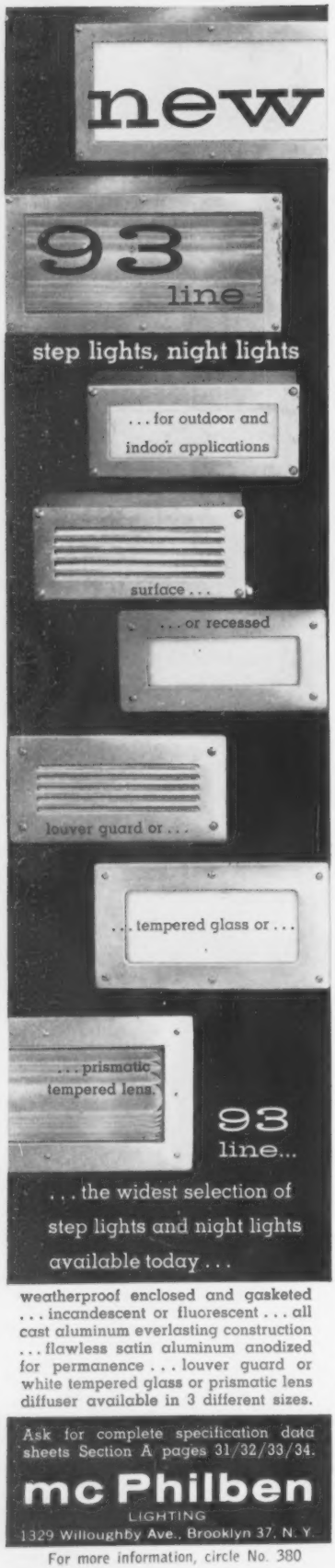
Projected Windows. LUPTON "Master" windows in projected or casement types—used equally well in curtain walls or in masonry construction. Tubular ventilator members for extra rigidity... double weatherstripping, bronze hardware.

LUPTON®

MICHAEL FLYNN MANUFACTURING COMPANY

Main Office and Plant: 700 East Godfrey Avenue, Philadelphia 24, Pa., West Coast Office and Plant: City of Industry (Los Angeles County), California.
SALES OFFICES: Stockton, California; Chicago, Illinois; New York City; Cincinnati, Ohio; Dallas, Texas. Representatives in other principal cities.

For more information, turn to Reader Service card, circle No. 431



weatherproof enclosed and gasketed . . . incandescent or fluorescent . . . all cast aluminum everlasting construction . . . flawless satin aluminum anodized for permanence . . . louver guard or white tempered glass or prismatic lens diffuser available in 3 different sizes.

Ask for complete specification data sheets Section A pages 31/32/33/34.

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LIGHTING
1329 Willoughby Ave., Brooklyn 37, N. Y.

For more information, circle No. 380

Continued from page 258

National Academy of Sciences–National Research Council, 2101 Constitution Ave. N.W., Washington 25, D.C., 1961. 59 pp., illus. $2.50

An up-to-date compilation of data and informed opinions on fire safety as it is affected by buildings, equipment, and personnel. Investigation was supported by a grant from the Educational Facilities Laboratories, Inc.

Decorative Cast Ironwork in Great Britain. Raymond Lister. G. Bell & Sons, Portugal St., London W.C. 2, 1961. 270 pp., illus. $5

A rich store of information on a trade of historical interest. Illustrations include many drawings by the author, who is a skilled and sensitive craftsman.

Industrial Building, Volume I. (Proceedings of first Industrial Building Exposition, December 1960.) Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N.Y., 1961. 232 pp., $10

Presentation of 38 papers from the recent congress, including discussions of modernization vs. new construction, use of various materials, financial considerations, and design criteria.

The Agony and the Ecstasy. Irving Stone. Doubleday & Co., Inc., 575 Madison Ave., New York 22, N.Y., 1961. 644 pp., $5.95

Biographical novel of the life of Michelangelo, by the author of Lust for Life. *Stone's four years of research took him to Florence, where he faithfully retraced Michelangelo's footsteps, consulted with Bernard Berenson, and used Berenson's vast private library; to Carrara, where he mastered the local dialect in order to work with the marble quarriers.*

The Dictionary Catalog of the Metropolitan Museum of Art. G. K. Hall & Co., 97 Oliver St., Boston 10, Mass., 1961. 24 vols., approx. 1000 pp. each. $1500

Reproduction of the 500,000 cards in the museum's library. Supplements to be issued periodically. Limited edition.

NOTICES

New Addresses

DAVE CHAPMAN, INC., Industrial Designers, 35 E. Wacker Drive, Chicago 1, Ill.

RALF E. DECKER, Architects, 1040 Washington Building, Seattle 1, Wash.

FORDYCE & HAMBY ASSOCIATES, Architects, 717 Fifth Ave., New York, N.Y.

WALLACE HOLM AND ASSOCIATES, Architects, The Abrego Building, 419 Webster St., Monterey, Calif.

GEORGE TANIER, INC., Furniture Import firm, 305 E. 63 St., New York 21, N.Y.

FRED W. TUEMMLER AND ASSOCIATES, Community Planning & Development Consultants, 4509 Beechwood Road, College Park, Md.

CECIL H. WELLS, JR., Consulting Engi-

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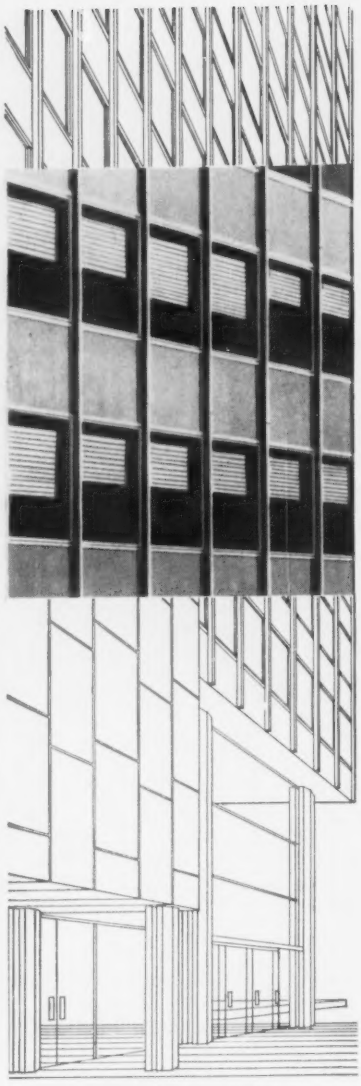
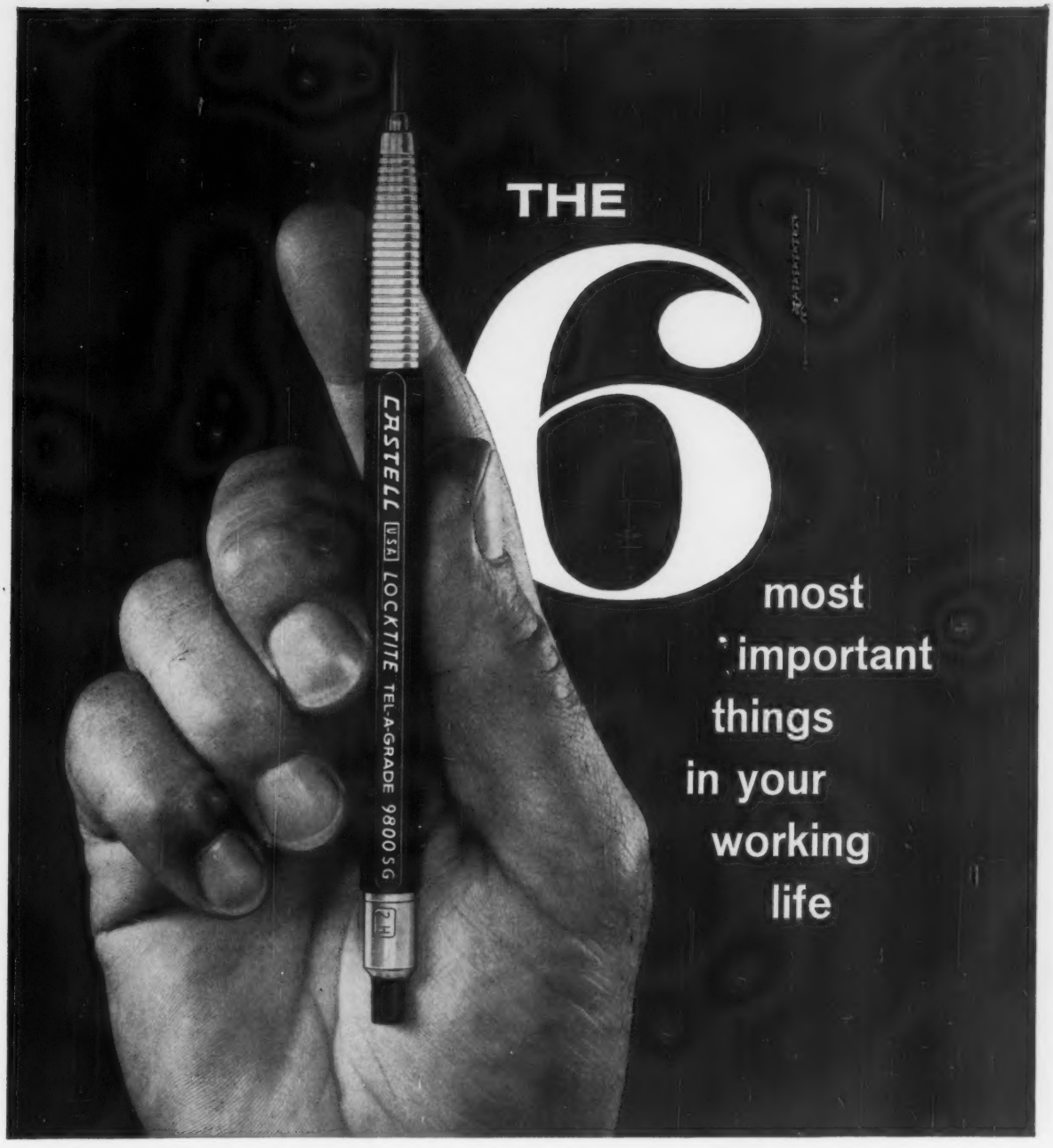


CURTAIN WALL

A refreshing new approach to metal curtain wall construction — Series 400 by Albro. It combines new design flexibility with light weight, economy and fast installation. Albro fabricates a complete line of aluminum, bronze and stainless steel systems — all backed by over 30 years of metal engineering know-how. See them in Sweets or write

ALBRO
Metal Products Corporation
944 Longfellow Avenue
New York 59, New York

For more information, circle No. 318



The 6 most important things in your working life are your five skilled fingers and your A.W.FABER #9800 SG LOCKTITE Tel-A-Grade Lead Holder.

LOCKTITE becomes a part of your creative process. The no-slip functional grip gives you smooth traction and practically banishes finger fatigue. Gun-rifled clutch holds the lead like the jaws of a bull dog. Unique indicator reveals the degree in use at a glance. Carries ironclad 2-year guarantee. A.W.FABER will replace the entire holder at no charge if any part wears out in normal usage. Yes, you can buy cheaper lead holders, but can you afford to let pennies stand between you and your perfect working tools? Buy quality —buy LOCKTITE, call your dealer today.

Castell Drawing Leads #9030, *are of the identical quality and grading as world-famous Castell wood pencil ■ Usable in all standard holders, but a perfect mate for Locktite ■ Draws perfectly on all surfaces, including Cronar and Mylar base films ■ Available in all degrees from 7B to 10H, and in a kaleidoscope of colors ■*

FABER-CASTELL

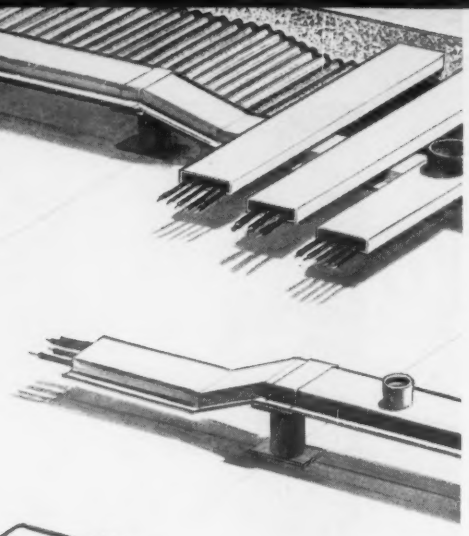
A.W.FABER-CASTELL
Pencil Co., Inc., Newark 3, N. J.

Our Bicentennial year—1761-1961
200 years of uninterrupted
manufacturing experience.

New floor system combines mechanical and electrical services

GRANCO A-E FLOOR

Design Flexibility • Increased Capacity • Ease of Installation

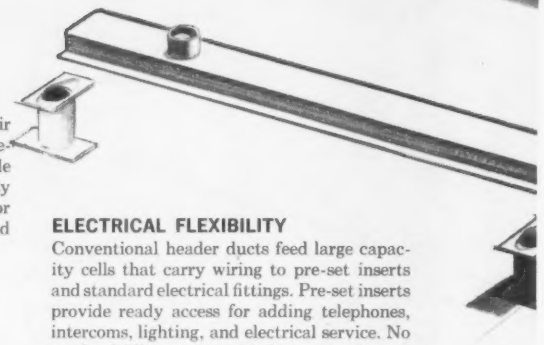


FOR ANY STRUCTURAL SYSTEM

A-E (Air-Electric) floor system fits any type construction—remodeling as well as new. Eliminates most horizontal air ducts. Reduces height between floors. Mechanical and electrical services can easily be expanded to meet future requirements.

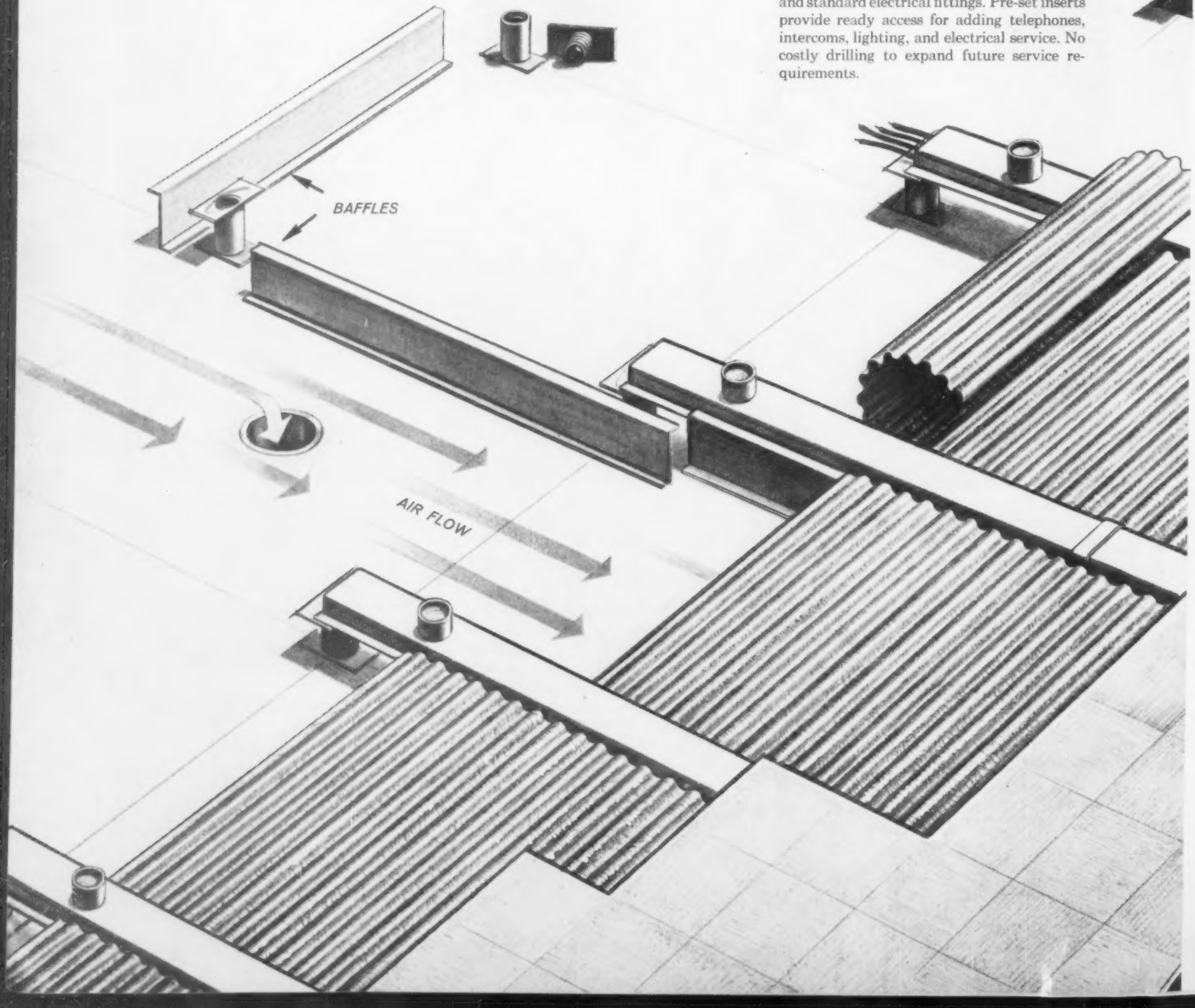
OPTIMUM AIR CAPACITY

Adjustable supports permit the height of air space to be varied to meet any capacity requirements. A 3″ plenum height will provide all the air normally required for low velocity systems. Adjustment assures level finish floor compensating for dead load deflection and irregularities in structural slab.



ELECTRICAL FLEXIBILITY

Conventional header ducts feed large capacity cells that carry wiring to pre-set inserts and standard electrical fittings. Pre-set inserts provide ready access for adding telephones, intercoms, lighting, and electrical service. No costly drilling to expand future service requirements.



AIR DISTRIBUTION CONTROL
Corrugated galvanized steel serves as form for finish floor slab and forms the top of an unobstructed air plenum. Baffles are used to zone air to desired areas. Perimeter discharge opening can be continuous or spaced as desired.

A-E FLOOR COMPLETE
Sill can be located at any height—important in curtain wall constructions. Speedy placement of air terminals, air grilles, and standard electrical outlets completes your A-E Floor System.

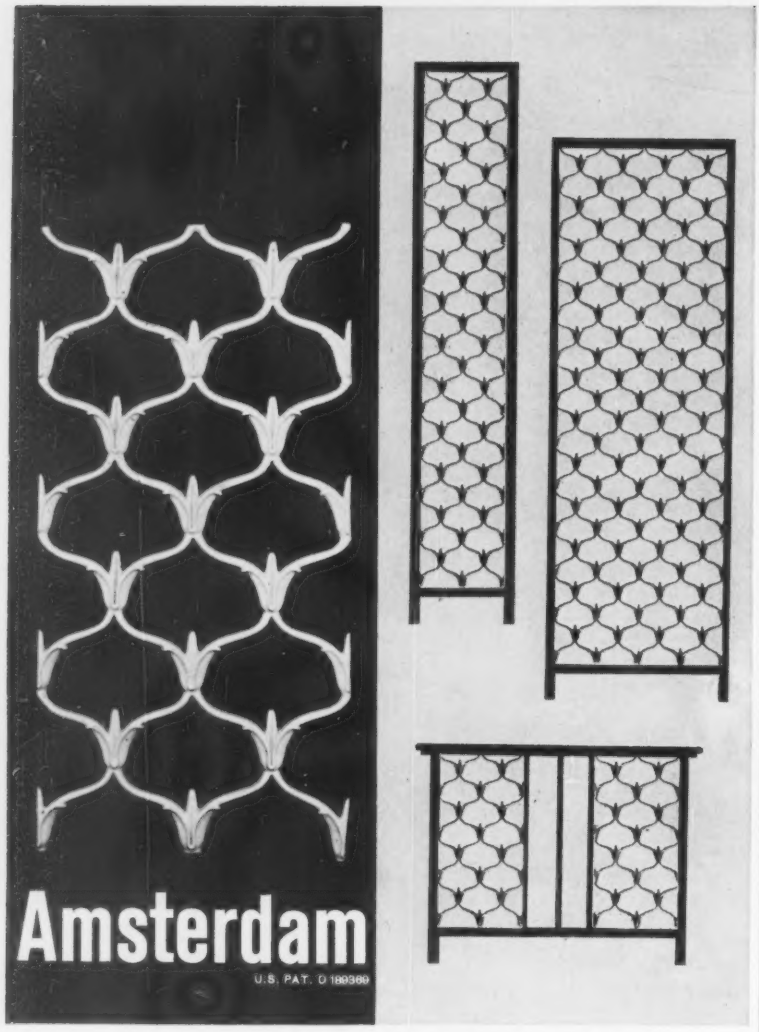
For additional information and details, write for A-E Floor catalog No. AE-601 (A.I.A. File No. 30). GRANCO STEEL PRODUCTS CO., 6506 N. Broadway, St. Louis 15, Mo. A Subsidiary of Granite City Steel Company.

A-E FLOOR

a floor system providing air and electrical distribution

GRANCO

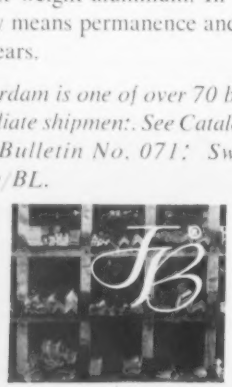
A-E FLOOR • TUFCOR® • CORRUFORM® • COFAR® • E/R COFAR® • ROOF DECK • UTILITY DECK • GRANCO VIN-COR® S-I-P BRIDGE FORMS® • PAVEMENT JOINTS • FREE FLOW SUBDRAIN



CONTEMPORARY TREILLAGE

Simple, stylized tulips combine with gentle ogee curves to produce the beautiful Julius Blum Amsterdam pattern. A graceful ornament for both contemporary and traditional design, it forms handsome screens, dividers, columns, railings, and gates. Equally adaptable to interior and exterior applications, Amsterdam panels are double-faced, cleanly finished, perfectly executed in non-shattering malleable iron or light weight aluminum. In either material, Julius Blum quality means permanence and economy, as it has for over fifty years.

Amsterdam is one of over 70 beautiful patterns stocked for immediate shipment. See Catalog No. 8, Ornamental Metalwork Bulletin No. 071; Sweet's Architectural File No. 6e/BL.



JULIUS BLUM & CO., INC.,
Carlstadt, New Jersey
Phones:
Carlstadt, GEneva 8-4600;
Philadelphia, MArket 7-7596;
New York, OXford 5-2236

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neer, 2031 Pioneer Court, Suite 12, San Mateo, Calif.

New Firms

BRACKE & HAYES, Architects, Bankers Life Building, Moline, Ill.

EZRA GORDON-JACK M. LEVIN & ASSOCIATES, Architects, 64 E. Jackson Blvd., Chicago 4, Ill.

PAUL C. SANGREE, Interior Designer and Interior Consultant to architects, 521 N. Howard St., Allentown, Pa.

LESLIE WHEEL & MARTIN GARON, Lighting Consultants, 767 Fifth Ave., New York 22, N.Y.

PHILIP A. WEISENBURGH, Architect, 1034 Architect & Builders Building, Indianapolis, 4, Ind.

New Partners, Associates

ARMANDO F. ARMIJO, made Associate in Charge of Design and Planning in firm of WALTER H. SOBEL AND ASSOCIATES, Architects, Engineers, Consultants, Chicago, Ill.

SIGMUND F. BLUM, made Associate in firm of SMITH, HINCHMAN AND GRYLLS ASSOCIATES, INC., Architects and Engineers, Detroit, Mich.

CARL W. ERNST, made Associate in firm of CHATELAIN, GAUGER AND NOLAN, Architects and Engineers, Washington, D.C.

HARRY B. RUTKINS, made Associate in firm of EGGERS AND HIGGINS, Architects, New York, N.Y.

Elections, Appointments

L. S. CURTIS, appointed Manager of the Baton Rouge office; GEORGE C. LOVE, appointed Project Manager of the Richland office; in firm of H. E. BOVAY, JR., Consulting Engineers, of Baton Rouge, La., and Richland, Wash.

CLARENCE A. DAUBER, appointed Head of Thermal Power Engineering in firm of CHAS. T. MAIN, INC., Consulting Engineers of Boston, Mass., and Charlotte, N.C.

ROBERT H. FOX, appointed Assistant Project Engineer in firm of WOODWARD-CLYDE-SHERARD AND ASSOCIATES, Montclair, N.J.

MAYNARD D. HOUSTON, named Executive Architect in firm of CHARLES LUCKMAN ASSOCIATES, Planners-Architects-Engineers, Los Angeles, Calif.

ROBERT E. MICHEMER, appointed Director of the Department of Specifications in firm of AUSTIN, FIELD & FRY, Architects-Engineers, Los Angeles, Calif.

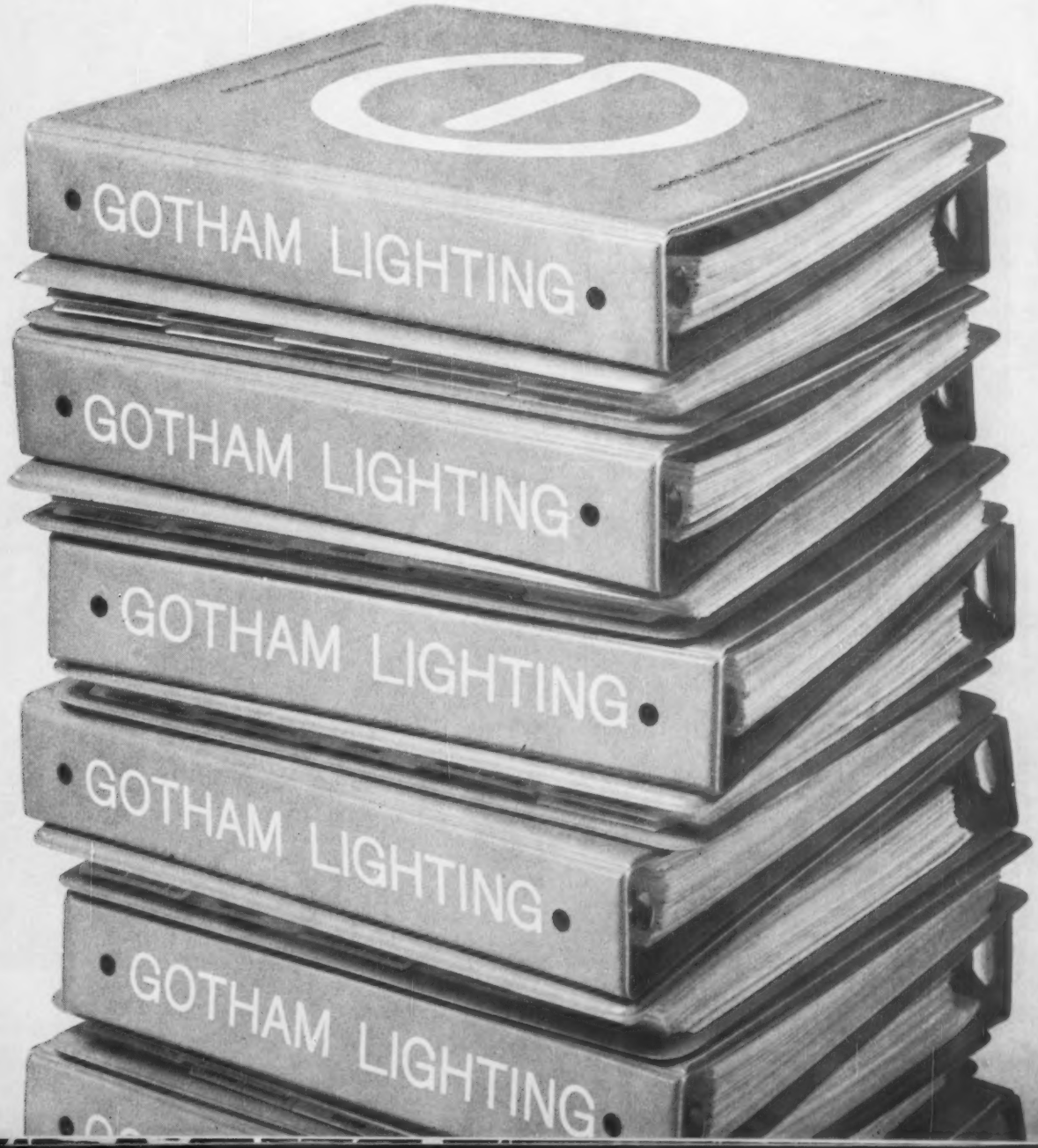
HAROLD K. PRATT, appointed Chief Civil and Hydraulic Engineer in firm of STANLEY ENGINEERING COMPANY, Consulting Engineers, Muscatine, Iowa.

MORRIS WELCH, appointed Executive As-

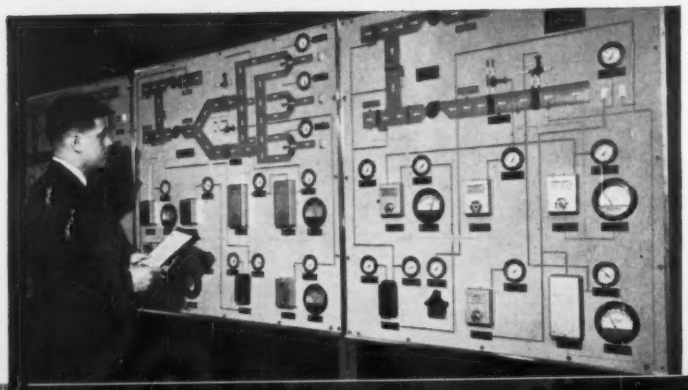
Continued on page 272

For more information, circle No. 354

Gotham Lighting Corporation's new catalog, just out, contains 110 pages of photographs, detailed drawings, and technical data relating to Gotham's more than 880 lighting units . . . candlepower distribution curves, rapid estimate charts, coefficients of utilization and efficiency. Gotham invites you to order your copy now. Write to: Gotham Lighting Corporation,
37-01 THIRTY-FIRST STREET, LONG ISLAND CITY 1, NEW YORK.

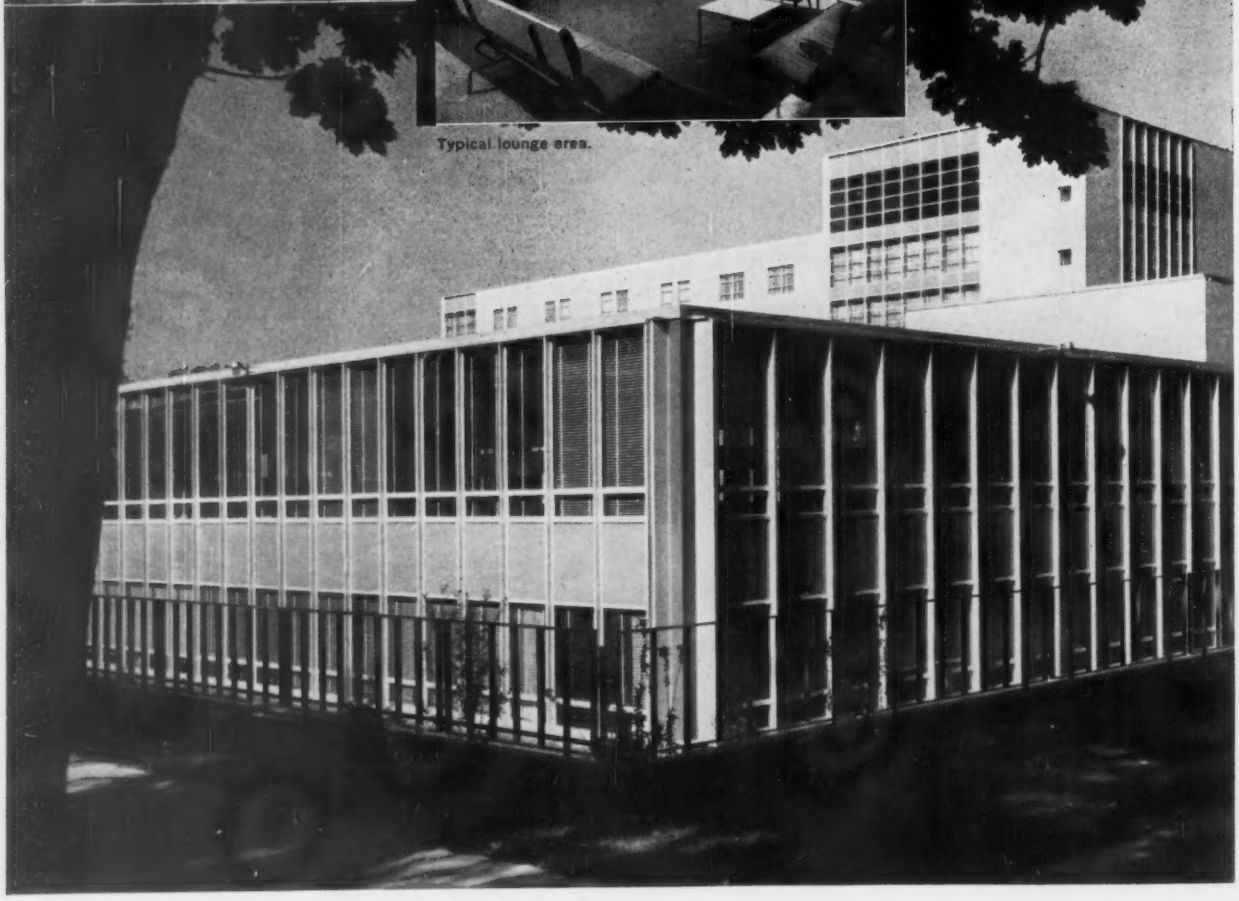


Behind the scenes, Johnson graphic panels simplify the supervision and control of air conditioning equipment. Temperatures in administrative areas and doctors' offices are individually controlled by the occupants.

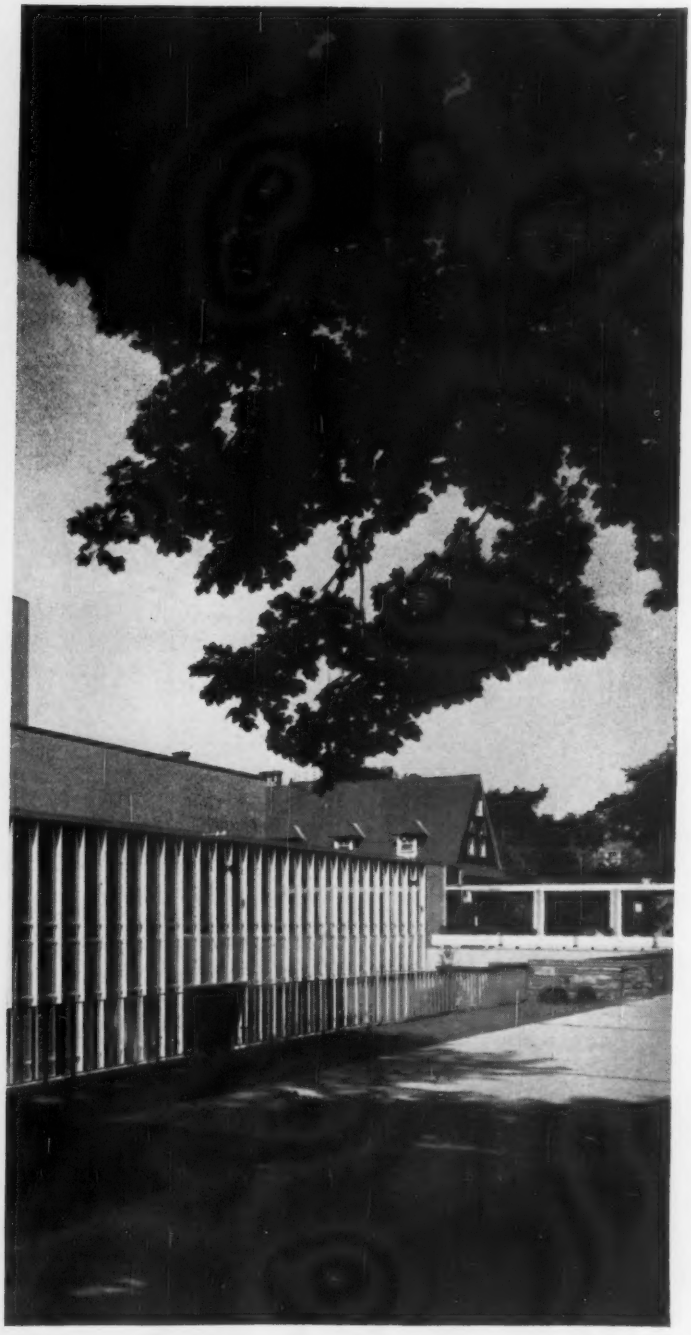


The Occupational Therapy Building includes a gymnasium-auditorium, model kitchen, workshop, library, snack bar, and beauty shop. It is rated among the best in the nation.

Typical lounge area.



North Building, Pennsylvania Hospital, Philadelphia. Martin, Stewart & Noble, architects; Robert Allan Class, associate architect; A. E. D'Ambly, mechanical engineer; Stofflet & Tillotson Corp., general contractor; Williard, Inc., mechanical contractor; all of Philadelphia.



controlled environment aids in mental care

Planned and equipped to utilize the latest concepts in psychiatric care, the new North Building of Pennsylvania Hospital, Philadelphia, is one of the outstanding institutions in its field. Actually, North "Building" consists of two buildings — the 5-story Patients' Building and the Occupational Therapy Building.

From floor plans to color schemes, furnishings, and equipment, each of these buildings provides a carefully controlled physical environment for the patients and staff. Both are fully air conditioned and equipped with specially planned Johnson Pneumatic Control Systems. Engineered for economy as well as for comfort, Johnson Control maintains ideal air conditions for every purpose with a minimum of time and attention.

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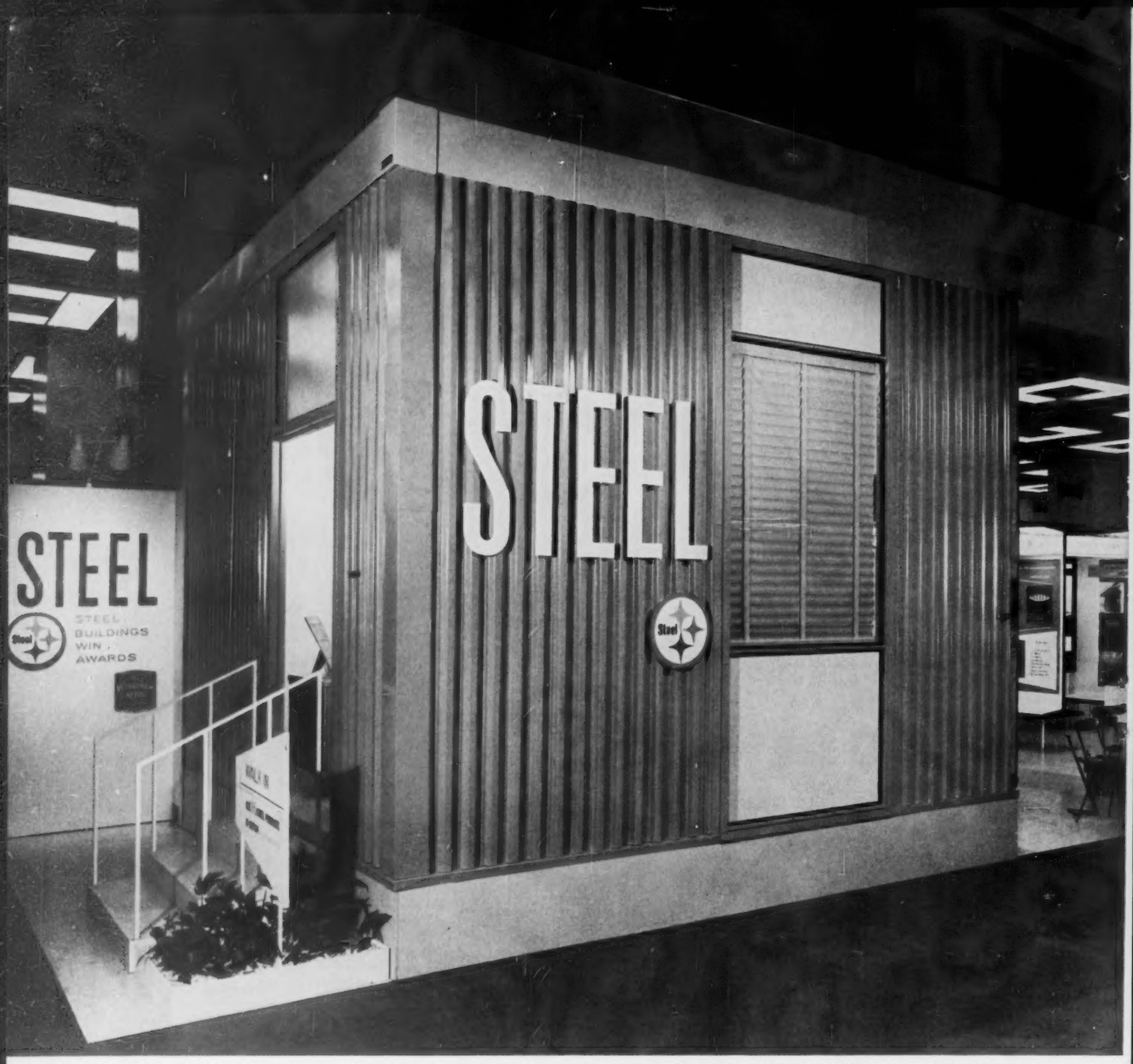

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- Dur-O-wal Div., Frontier Mfg. Co., Box 49, **PHOENIX, ARIZ.**
- Dur-O-wal Prod., Inc., 4500 E. Lombard St., **BALTIMORE, MD.**
- Dur-O-wal of Ill., 260 S. Highland Ave., **AURORA, ILL.**
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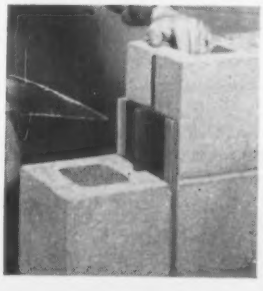
- Dur-O-wal of Colorado, 29th and Court St., **PUEBLO, COLO.**
- Dur-O-wal Inc., 1678 Norwood Ave., **TOLEDO, OHIO**
- Dur-O-wal Ltd., 789 Woodward Avenue, **HAMILTON, ONTARIO, CANADA**



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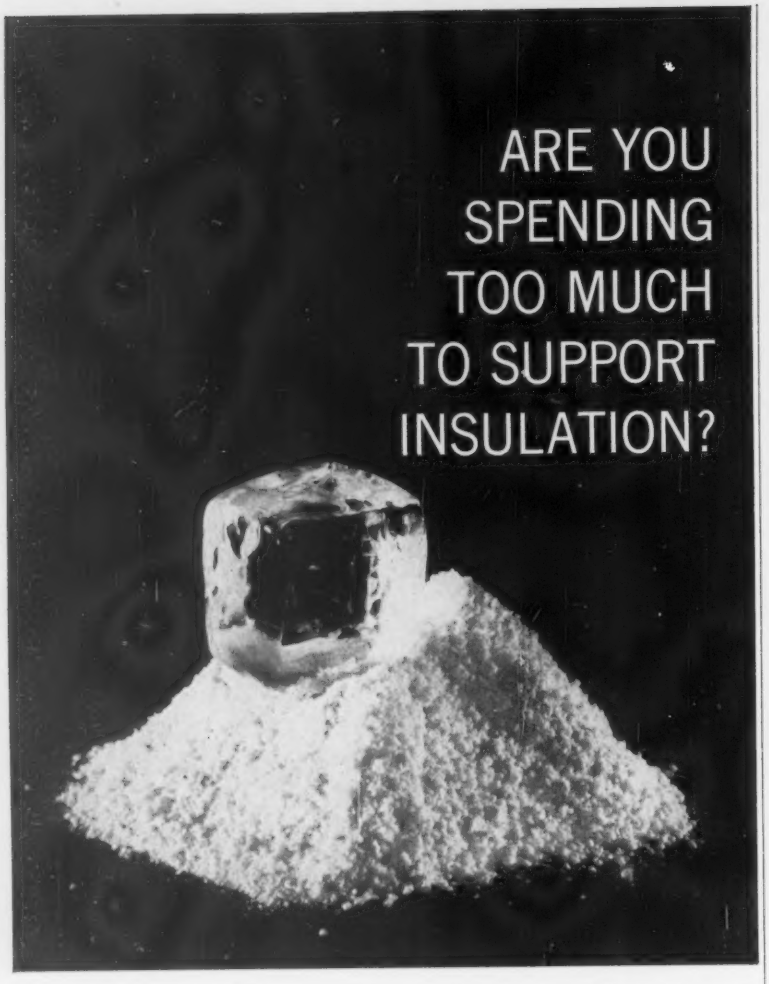

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Further, Permalite concrete does double duty – with it you can form drainage slopes, cants and saddles and, at the same time, provide insulation. In light construction, Permalite concrete provides the structural deck over permanent forms, as well as the insulation. Final advantage – Permalite insulating concrete is easily placed on any shape of roof!

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Firm _____
Address _____

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Continued from page 266

sistant to the President in firm of TOM LEE LIMITED, Interior and Industrial Designers, New York, N. Y.

Name Changes

BLATNER AND WILLIAMS, Architects, 11 N. Pearl St., Albany 7, N. Y. Formerly HENRY L. BLATNER, Architect.

BODMAN, MURRELL, LANDRY & WEBB, Architects and Engineers, Baton Rouge, La. Formerly BODMAN & MURRELL & SMITH. WILLIAM BAILEY SMITH has accepted a position as Assistant to EDWARD D. STONE, F.A.I.A., New York, N. Y.

COWELL & RADENHAUSEN, Architects-Engineers, 350 Madison Ave., New York, 17, N.Y. Formerly COWELL & ROBINSON, Architects-Engineers.

GERMANSON-FOSS & Co., Architects and Engineers, 1308 Pierce St., Sioux City 5, Iowa. Formerly GERALD GERMANSON, Architect of Sioux City, and FOSS & COMPANY, Architects and Engineers of Moorhead, Minn.

JAMES B. GODWIN & ASSOCIATES, Landscape Architects and Planners, 910 Odd Fellows Building, Raleigh, N.C. Formerly GODWIN & BELL.

ROTHBAUM & DAVIS, Consulting Structural Engineers, 215 S. Broad St., Philadelphia 7, Pa. Formerly NICHOLSON, ROTHBAUM & DAVIS. HORACE B. NICHOLSON, retired, will be available for consultation to the firm.

URBAHN BRAYTON & ASSOCIATES, Architects, 635 Madison Ave., New York, N.Y. Formerly URBAHN BRAYTON & BURROWS, Architects.

P/A Congratulates . . .

C. W. BOYLE, appointed General Sales Manager in firm of PLASTEEL PRODUCTS CORPORATION, to succeed SAMUEL D. SAUL, who was elected Executive Vice-President.

ALFRED E. BUSCH elected President in firm of KEUFFEL & ESSER CO.

JOHN C. CAIRNS elected Chairman of the Board, HOWARD L. RICHARDSON elected President, in firm of THE STANLEY WORKS.

ALBERT C. FRANSON appointed General Sales Manager, and JOHN C. PEPPLER made Assistant General Sales Manager in firm of BRIGGS MANUFACTURING CO.

AMORY HOUGHTON elected Chairman of the Executive Committee, and WILLIAM C. DECKER elected Chairman of the Board of Directors and Chief Executive Officer in firm of CORNING GLASS WORKS. THOMAS S. WOOD, JR. has been elected as Vice-President.

Arcadia-Acme Merger

Two Western producers of architectural metal building products, ARCADIA METAL

PRODUCTS and ACME METAL MOLDING COMPANY, will combine operations under a proposed acquisition and realignment. Headquarters of both companies will be at 5022 Triggs St., Los Angeles 22, Calif.

New Branch Showroom

HERMAN MILLER INC. announces the opening of a wholesale and retail shop of fabrics and textile items at 8 E. 53 St., New York City.

Hawaiian Association

AUSTIN, FIELD & FRY, Los Angeles architects-engineers, and the Hawaiian architectural firm of FRANK SLAVSKY, announce the formation of a Pacific Division association with offices in the Halau Building, International Market Place, Honolulu, Hawaii.

Acquisition and Appointments

CHARLES LUCKMAN ASSOCIATES, planning-architecture-engineering firm of Los Angeles, has acquired full interest in RICHARD GEORGE WHEELER & ASSOCIATES, Architects and Engineers of San Diego, Calif. Architect CHARLES LUCKMAN, president of the firm, has been named to the Advisory Committee of the National Rivers and Harbors Congress for the 16th Congressional District of California. The firm also announces the appointments of HAROLD D. HAUF as Vice-President in charge of Design and Planning, and NATHAN K. VAN OSDOL, JR. as Project Architect.

A SOURCE LIST FOR STEEL FURNITURE

This list comprises manufacturers and distributors who have either interesting single pieces or extensive collections of steel furniture. Several firms offer custom manufacture or consultant design services. Pictorial literature is generally available upon request.

Hugh Acton Inc., 588 Brookside, Birmingham, Mich.
Aetna Steel Products Corp., 730 Fifth Ave., New York, N.Y.
Albano Contract Div., 309 E. 46 St., New York, N.Y.
All-Steel Equipment Co., Griffith Ave., Aurora, Ill.
Art Metal Inc., Jamestown, N.Y.
Avard, Inc., 363 E. 62 St., New York 21, N.Y.
Corry-Jamestown Corp., Corry, Pa.
Creative Metal Products Inc., 515 Madison Ave., New York, N.Y.
Cumberland Furniture Corp., 4 E. 53 St., New York, N.Y.
Design Previews, 160 E. 56 St., New York, N.Y.
Designcraft Metal Mfg. Corp., 155 27 St., Bklyn, N.Y.
Desks Inc., 71 Fifth Ave., New York, N.Y.
Richard Draper & Co., 16 E. 52 St., New York, N.Y.
Edgewood Furniture Co., 334 E 75 St., New York, N.Y.
General Fireproofing Co., Youngstown, Ohio
Globe-Wernicke Co., Norwood, Cincinnati 12, Ohio
Helikon Furniture Co., 543 Madison Ave., New York, N.Y.
Knoll Associates, 320 Park Ave., New York 22, N.Y.
Laverne, Inc., 160 E. 57 St., New York 22, N.Y.
Lehigh Furniture Corp., 16 E. 53 St., New York, N.Y.
The Leopold Co., 914 Osborn, Burlington, Iowa
Frederik Lunning Inc., 667 Fifth Ave., New York, N.Y.
Macey Fowler, Inc., 500 Park Ave., New York, N.Y.
Herman Miller Furniture Co., 305 E. 63 St., New York, N.Y.

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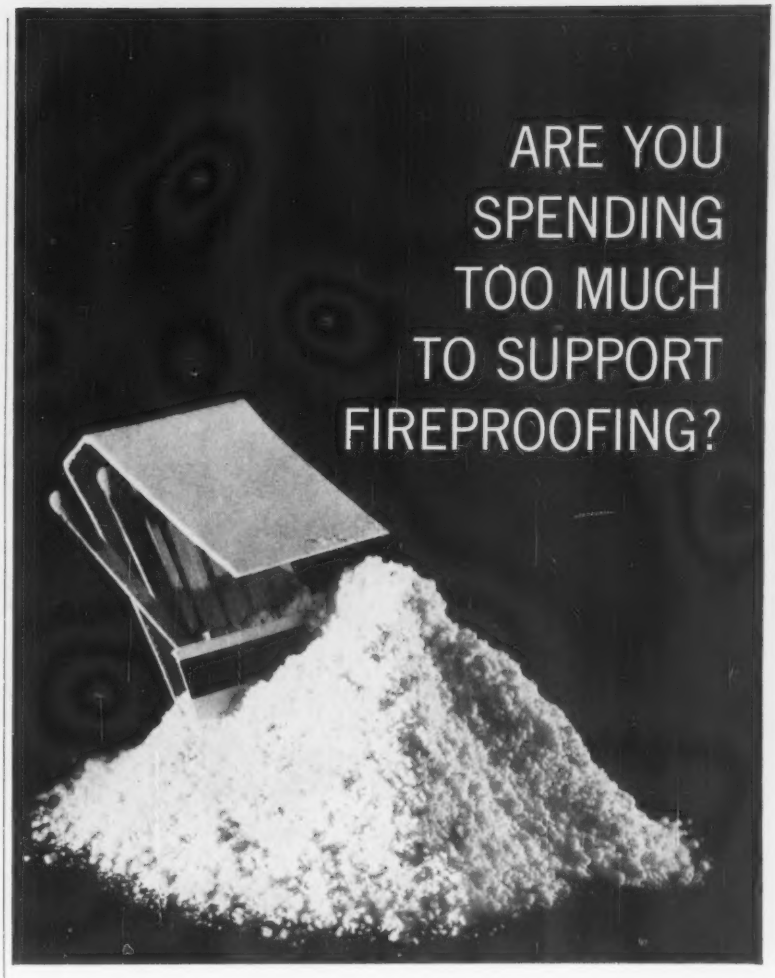

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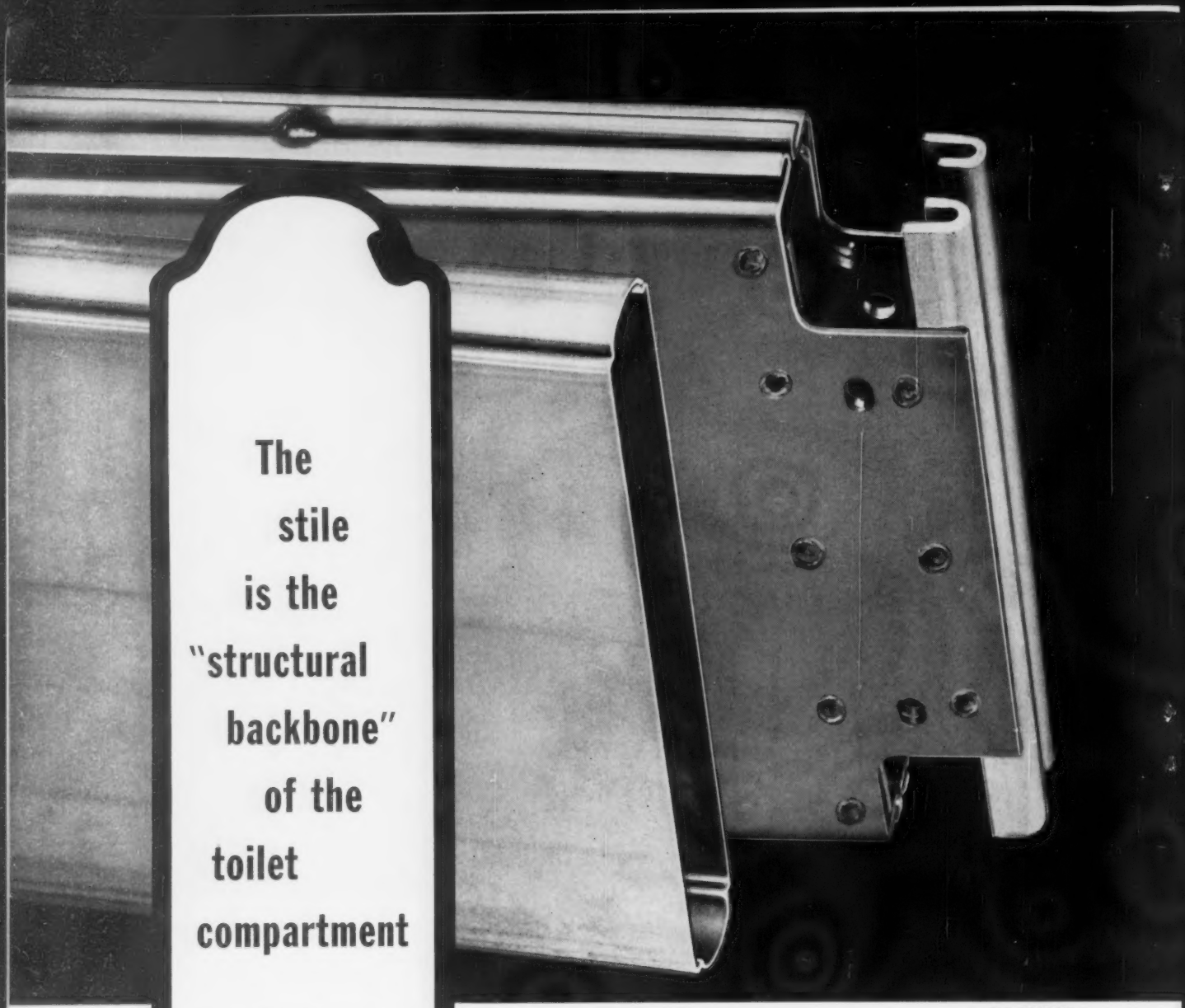
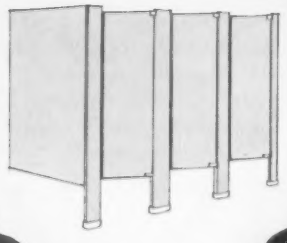


The stile is the "structural backbone" of the toilet compartment



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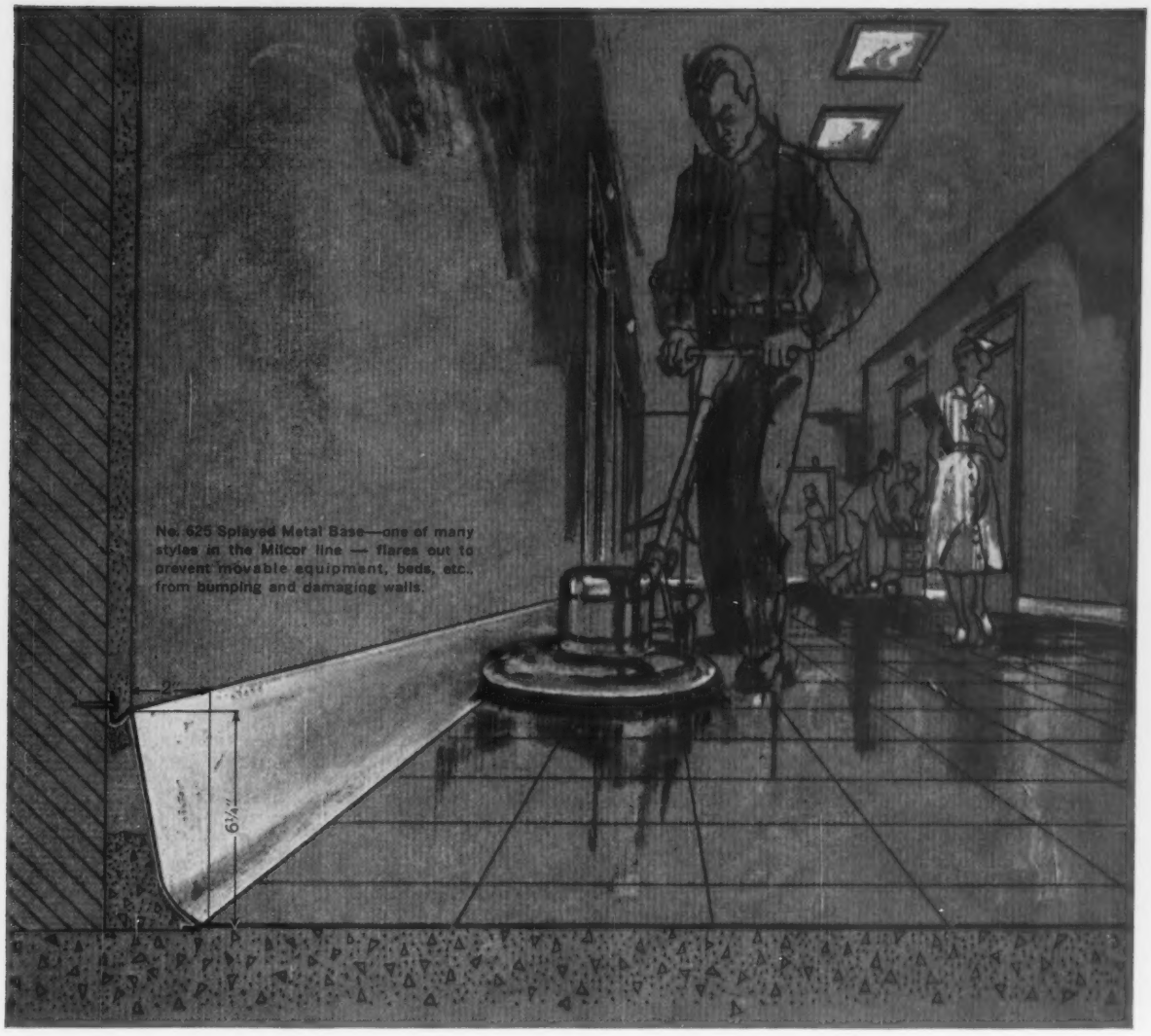
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SL-60

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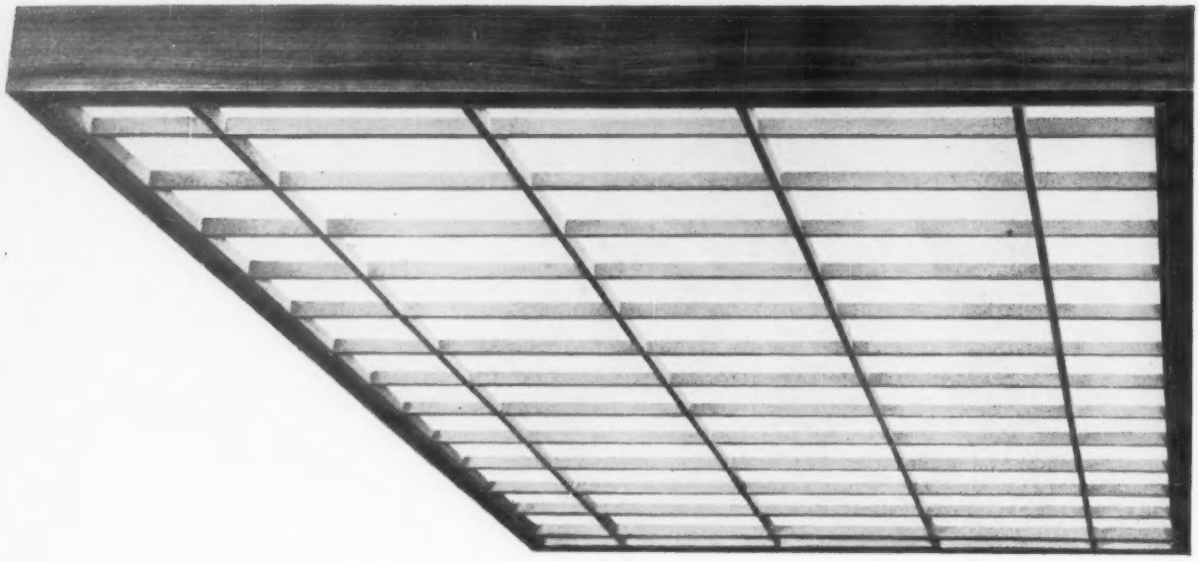
There's been a stunning metamorphosis in fluorescent lighting. To its efficiency, Lightolier has now added beauty to enhance both the fixture and its surroundings as well. Below: *Corona*, a shallow panel of light surrounded by a rich walnut frame and traced with handsome birch baffles. Its opposite number is *Coronet*, in many respects

STRIKING METAMORPHOSIS



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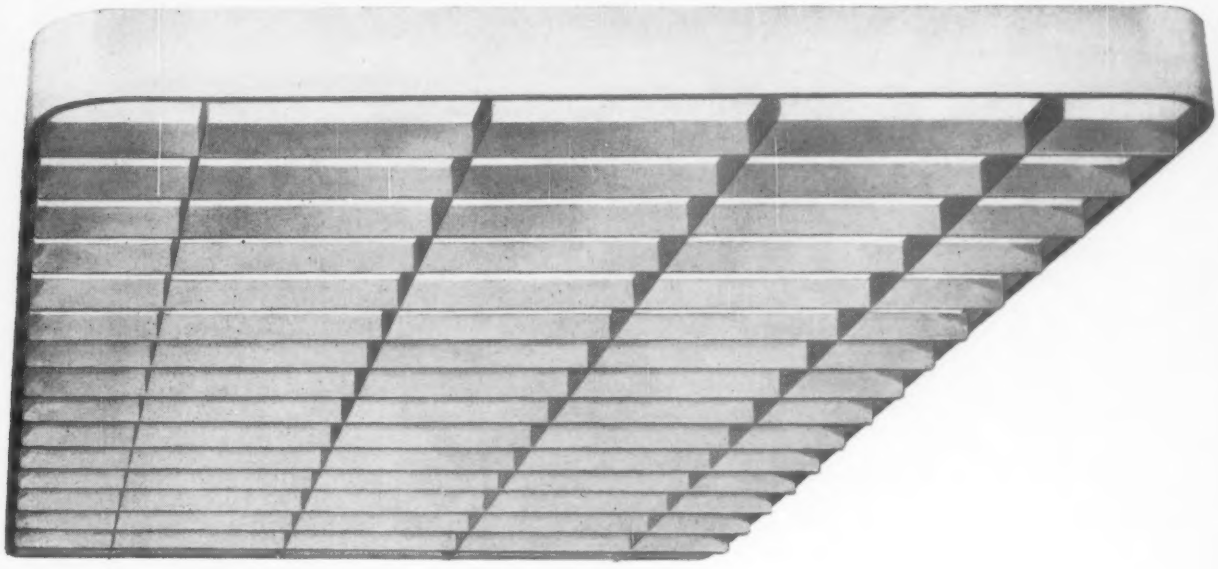

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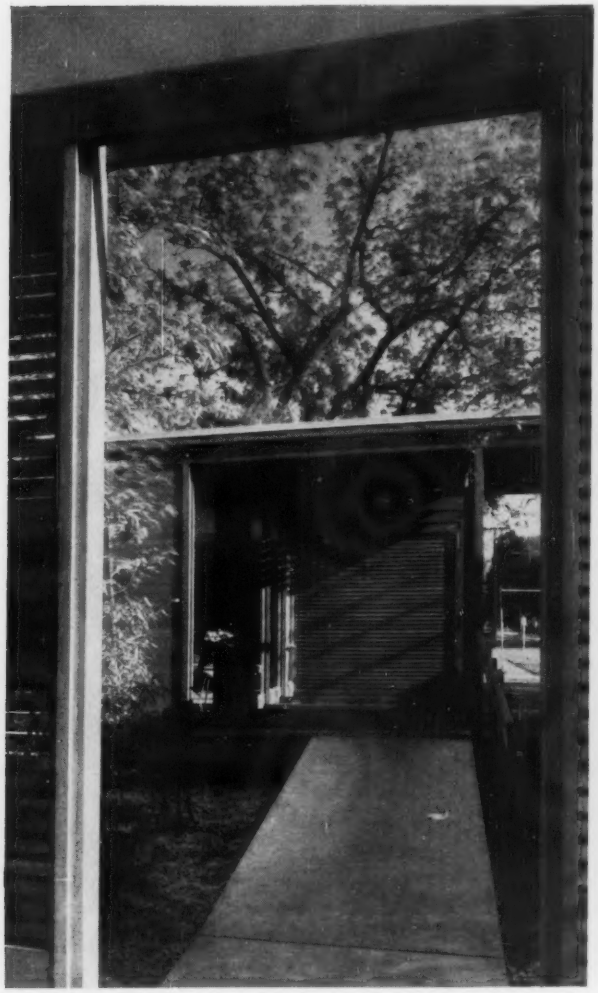

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Convention Hall
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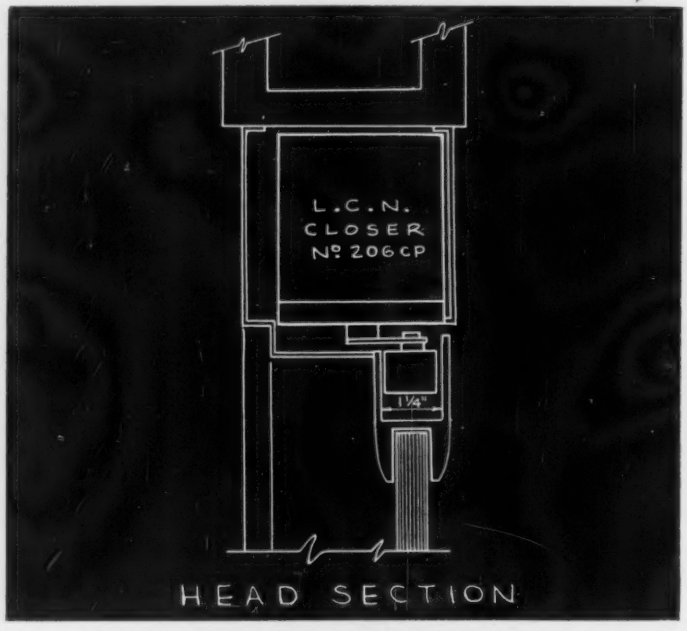

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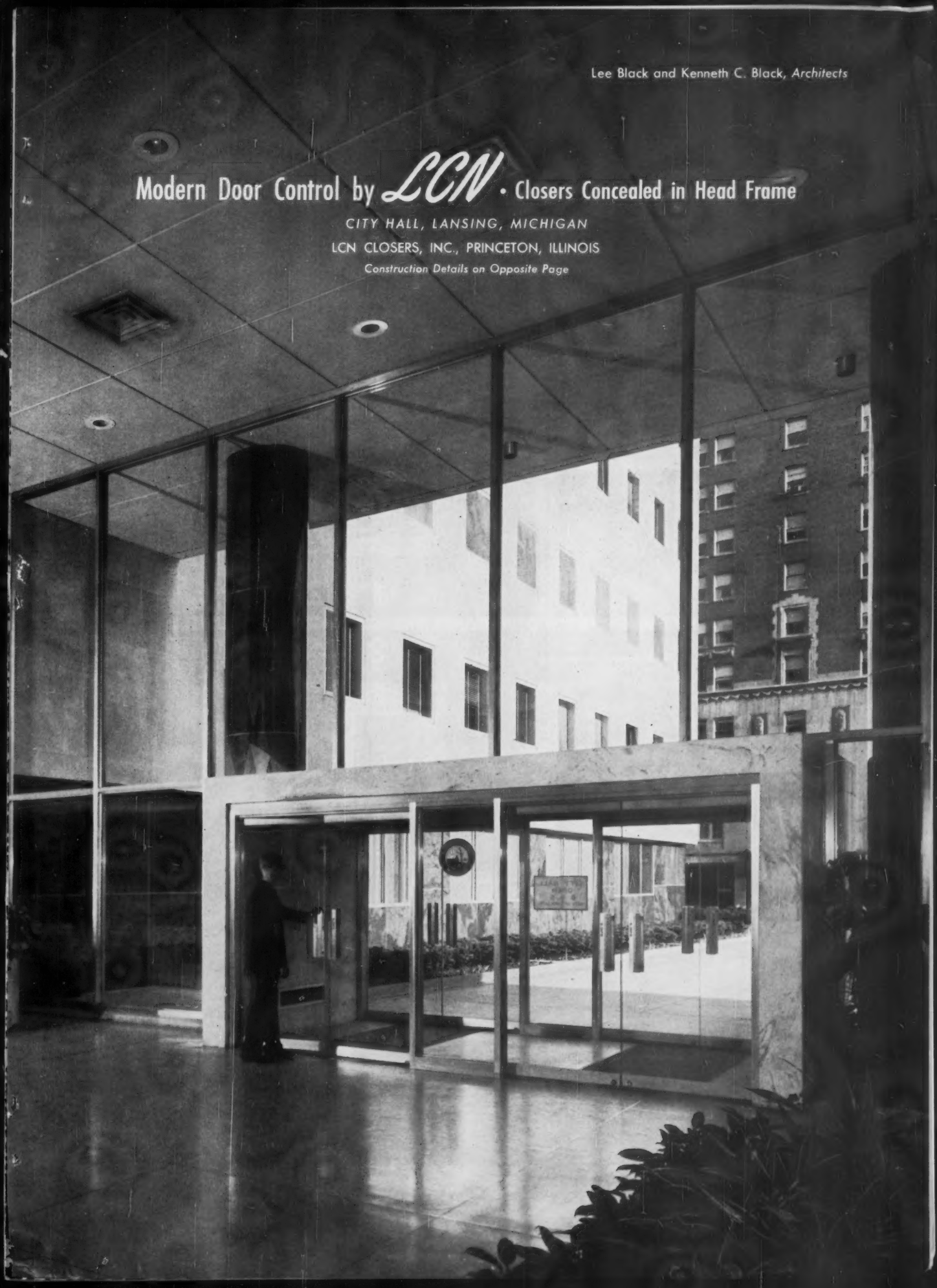

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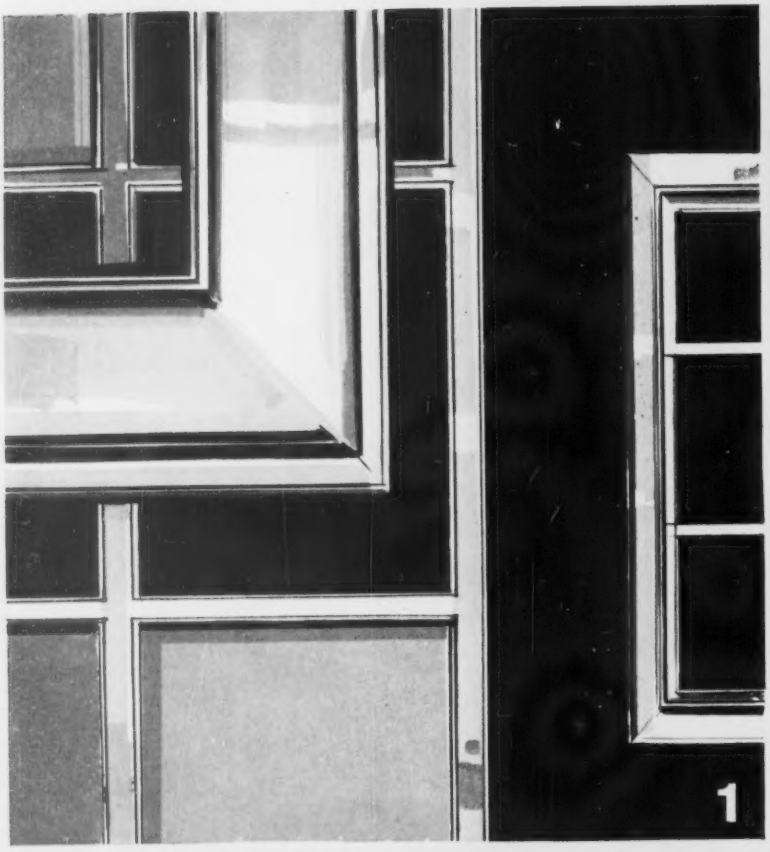
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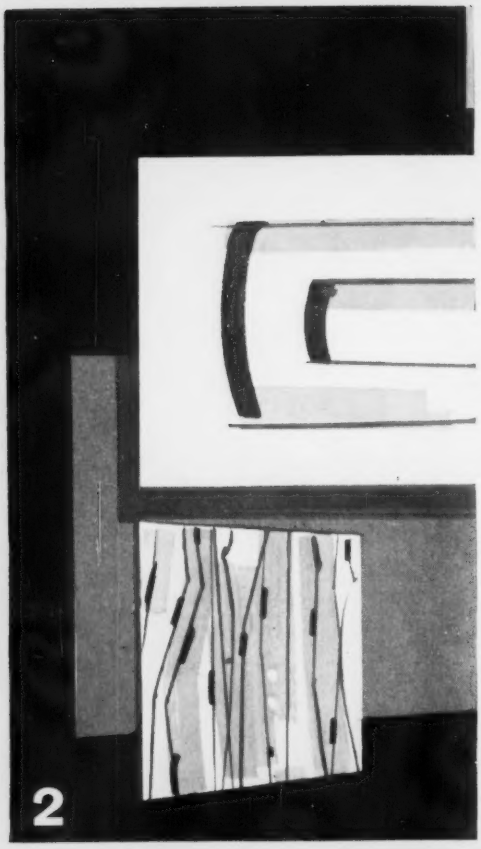
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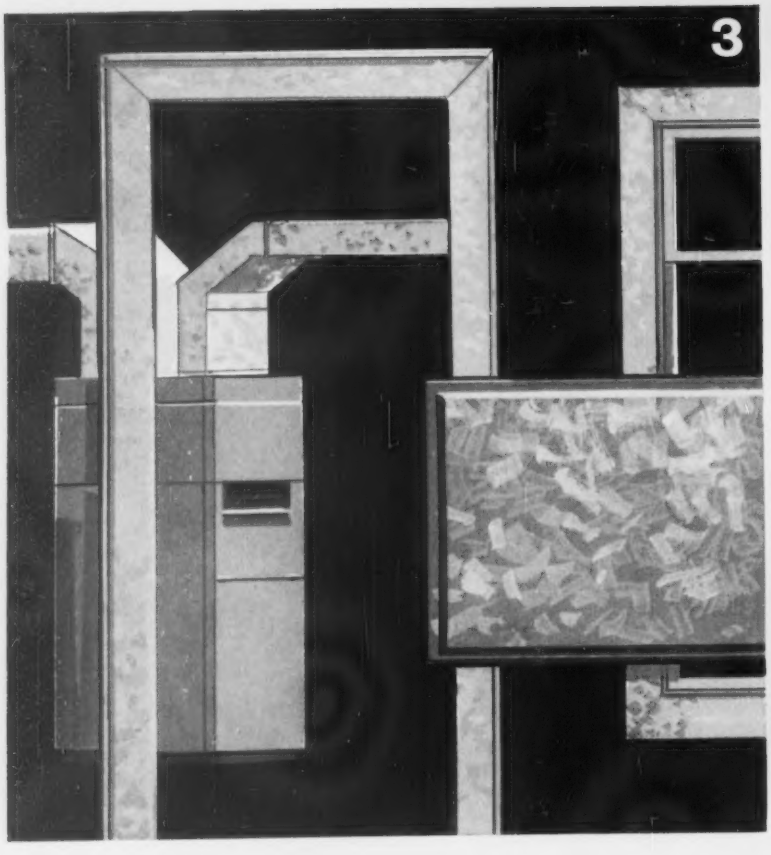
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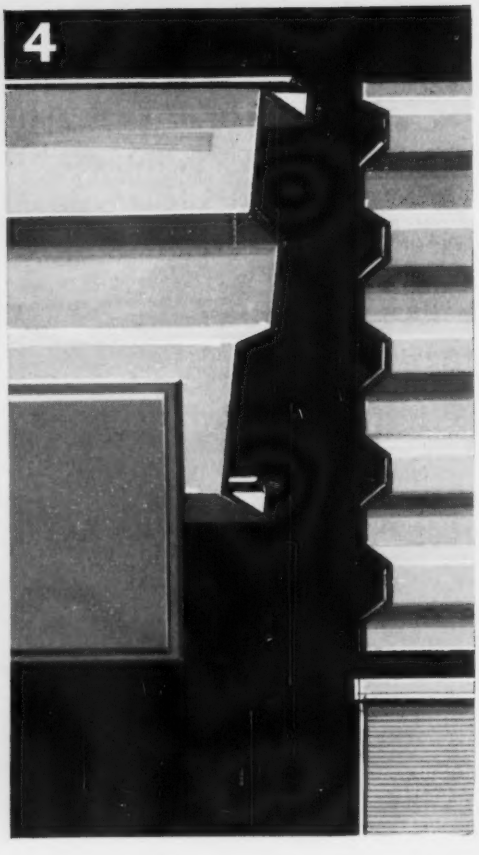
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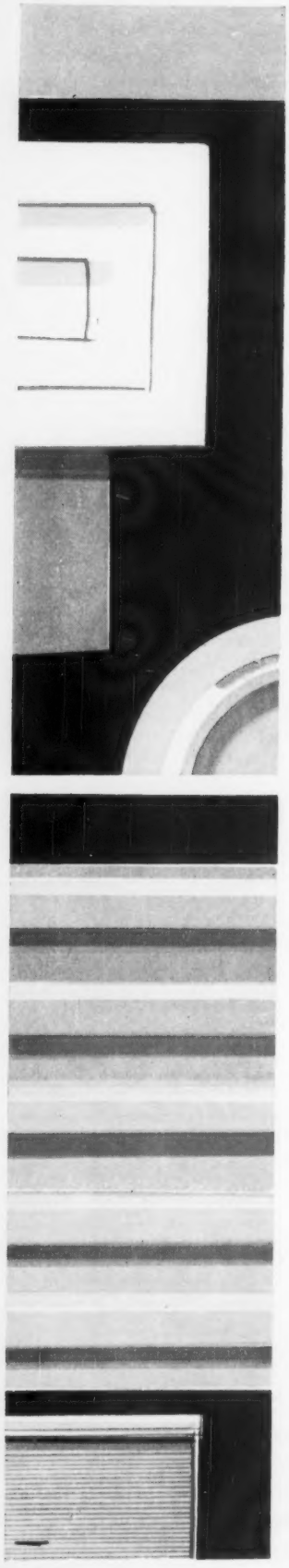

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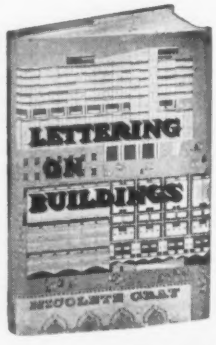

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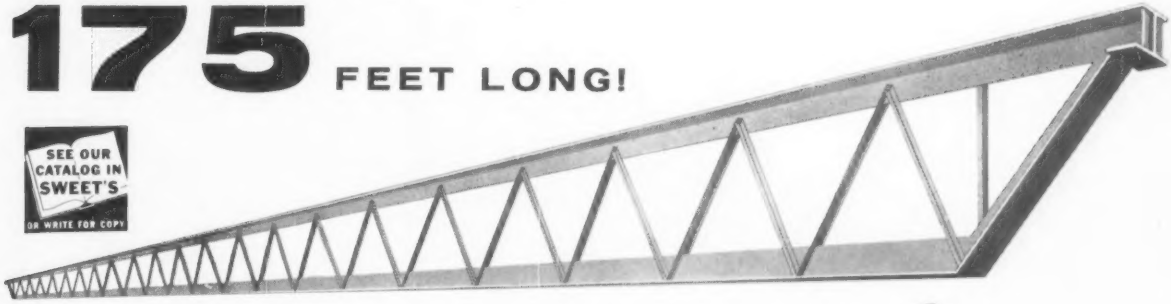

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The Employee Who Wants to Advance, in design, construction technology, or any other aspect of architecture, is still pretty much on his own in an architectural office. We do not have a recognized period of interneship, as the medical profession does, or any other regularized time of apprenticeship or clerkship as other trade and professional groups have. The Log Book experiment of the AIA is apparently working reasonably well in some areas, but by and large neither the profession nor the schools assume responsibility for a practical-professional training period after the academic graduation, nor for the more thorough leadership in creative development which is often so necessary.

By coincidence, I have talked recently to several young men who have been employed in "good" offices in various capacities—designer, draftsman, even construction superintendent—who are restive and frustrated. It isn't simply the old problem of being stuck with one type of specialized work; it's that even within a specialty there hasn't been the opportunity to learn from the architect himself—chosen as employer originally because he was admired—that the employee had hoped for. Busy offices can't be classrooms; active practitioners can't be teachers. I recently asked an architect friend what he thought of a young man who was working for him on the basis of my recommendation, and he said, "Golly, I feel awfully badly about it, but you know I'm not even sure that he's still in the office; I don't get to see half our people."

From the point of view of the architect, I think this is too bad; one of the great rewards of competency should be the pleasure of passing on knowledge and skills to others. From the point of view of the profession, it is dangerous; no professional group continues to fulfill its social function without the continual training of new members. And from the point of view of the employee, it is indeed frustrating. One man told me recently that he was searching for a way to go back to school for graduate work—under a respected teacher. "I feel that I need personal direction and contact with a fine architect—as teacher, since I can't get it from one as boss. I went with Blank, thinking I could learn from him what I hadn't gotten in school—creative approach to real problems—but I see him about once a month."

Possibly the belief that working under the direction of a maestro leads more surely to development of one's own abilities is fallacious. You can count on a few fingers the number of independently creative architects who spent time at Taliesin. Another young man I met recently had been with Wright for a time, as a matter of fact, and then had gone abroad and worked with several other "greats." He seems so far to have picked up superficial mannerisms and not much else. But in the long run, and considering the profession as a whole, I think it would be useful if the architects who have something to teach to the people working under them could find a way to impart it.

One problem, of course, is the economic one. "Unfortunately I haven't time to be a teacher in my own office," says one fine architect. "When I hire a man as a draftsman or a designer or a spec writer or an outside supervisor, he has to produce. He has to earn his salary. If I had to go over each step with him and direct and correct and explain, I'd soon be out of business—and then whose work would you publish?" And for his part, the employee usually has to earn his salary with no risk that he be considered unsure, incapable, or not up to others in the drafting room.

One suggestion I have heard is that an office with a conscience about this problem recognize two types of help: the man who wants to continue learning and is willing to accept a lower income for a time with the status of a learning-apprentice (and with the possibility, depending on his development, that he might rise higher and faster than he otherwise would); and the man who wants a job with as high an immediate salary as the office can pay, and with a feeling that he will advance because of abilities he already has. The first would be doing graduate-school work with practical application: the second would be a full working member of the staff. I wonder if anyone's tried this?

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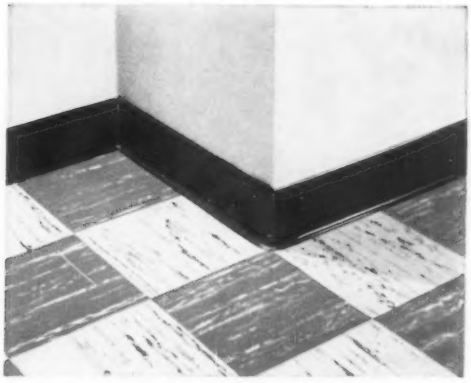
1. 

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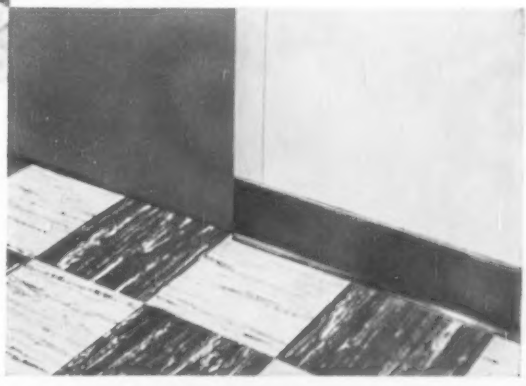
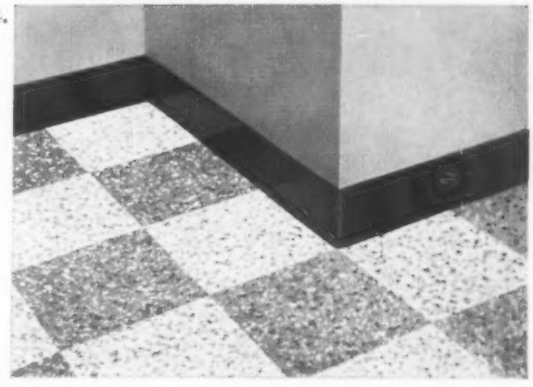
3. 

4. 

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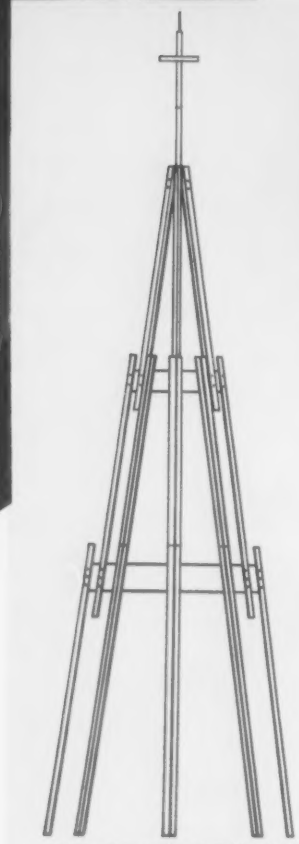

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